APR 5 1912

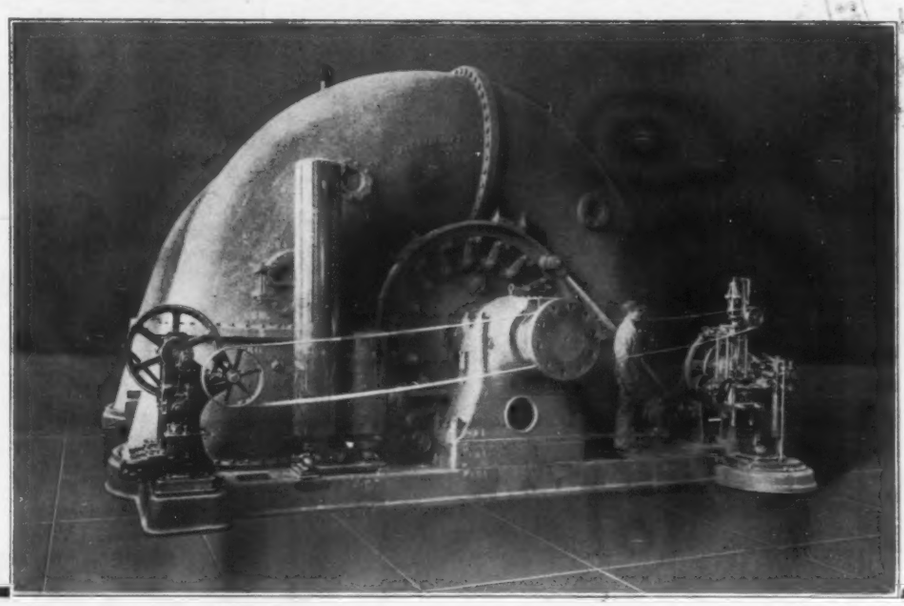
JOURNAL OF ELECTRICITY

POWER AND GAS

Devoted to the Conversion, Transmission and Distribution of Energy

Entered as second-class matter May 7, 1906, at the Post Office at San Francisco Cal., under the act of Congress March 3, 1879

VOL. XXVIII NO. 13 — SAN FRANCISCO, MARCH 30, 1912 — PER COPY, 25 CENTS



LOMBARD GOVERNORS

Engraving shows One of Three Units of Type N-14, 60000 ft. lb, Governors including separately mounted Pump and Tanks, all mounted on Water Wheel Base, furnished the Portland Railway Light & Power Co., Portland, Ore.

Standard and Special Governors for All Requirements

RELIEF VALVES --- SPEED AND FREQUENCY RECORDERS --- TACHOMETERS

Send us complete data on water wheels to be governed and we will make up and submit to you a proposal on suitable governors for your work

PIERSON, ROEDING & CO.

118-130 NEW MONTGOMERY ST., SAN FRANCISCO, CAL.

COLMAN BLDG., SEATTLE, WASH. SPALDING BLDG., PORTLAND, ORE. PACIFIC ELECTRIC BLDG., LOS ANGELES, CAL.

Alphabetical Index to Advertisers, Page 8. Where to Buy It in the West, Pages 9, 10, 12.

WE CARRY A COMPLETE STOCK IN SAN FRANCISCO

Safety Rubber and Lead Cable

SINGLE AND DUPLEX CONDUCTORS
600 VOLTS AND 2200 VOLTS

The same care employed in producing our Rubber Insulated Wire is further exemplified in our rubber and lead cable.

We lead sheath the same rubber insulations in establishing a Safety Standard cable. Send for booklet.

Cable Terminals and Potheads—Compound and Tape

Dependable Quality—Right Prices—Quick Service

WRITE US FOR QUOTATIONS

The Safety Insulated Wire and Cable Co.

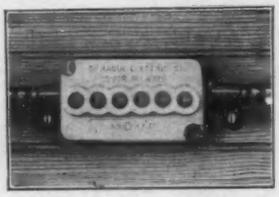
RALPH L. PHELPS, MGR.

Pacific Coast Department, 589-591 Howard Street

SAN FRANCISCO

SPRAGUE STAMPED STEEL BOXES

No. 6350 Octagon Box with 6383 Canopy Cover 4" diam.. $1\frac{5}{8}$" deep.



No. 6320—6-Wire Porcelain Cover. with No. 6300 Multilet.

Sprague Stamped Steel Boxes and Fittings will save time on every installation, besides insuring safety and uniformity. Folds and rivets have been eliminated. Knock-outs are easily and cleanly removed when desired. All boxes are shipped in Unit and Standard packages.

Our octagon boxes afford perfect securance of locknuts and bushings on a flat surface. One complete set of covers is adaptable to both the octagon and the round boxes.

No. 6200 Box with 6206 Canopy Cover with Ears Drilled and Tapped.

Descriptive Catalog No. 43654 Sent Free on Request

SPRAGUE ELECTRIC WORKS

Of General Electric Company

MAIN OFFICE:

527-531 West 34th St., New York, N.Y.

Branch Offices in Principal Cities

Dearborn Drug & Chemical Works

Manufacturers of Water Treating Preparations to prevent scale, corrosion, pitting and foaming in Steam Boilers

General Offices, Laboratories, and Works: Chicago

948 East Second St., Los Angeles, Cal. 250-254 Front St., San Francisco, Cal.

E. C. HUGHES, PRESIDENT ADOLPH MEESE, SECRETARY

E. C. HUGHES CO.

PRINTERS — ENGRAVERS — BOOKBINDERS

LET US FIGURE ON YOUR CATALOGUE AND OTHER PRINTED MATTER

Printers and Binders of the Journal of Electricity and other Publications

147 to 151 Minna Street, San Francisco. Phone Kearny 806

LEAHY OIL BURNERS hold the record

for Economy, Simplicity and Long Life Thorough Atomization No Back Pressure

Oil Feed at Right Angles to Steam — Best Regulation — *Write for Circular*

LEAHY MANUFACTURING CO.

8TH & ALAMEDA STREETS, LOS ANGELES, CAL.

Hammel Oil Burner Co.

Oil Burners for Locomotives and Stationary Boilers

640, 641, 643 & 645 North Main Street, Los Angeles, Cal.

The Watthour Meter

The Only UP-TO-DATE Meter Book on the Market

An illustrated book of 200 pages showing how the Watthour Meter is made, how it measures and records, how it is connected and how tested. Its theory is clearly explained without the use of higher mathematics and its practical operation and maintenance plainly and concisely set forth. The Watthour Meter is indispensable to Meter Man and Central Station Manager. Price $2

TECHNICAL BOOK SHOP, Rialto Building, San Francisco

B 27 3 267

JOURNAL OF ELECTRICITY
POWER AND GAS
Devoted to the Conversion, Transmission and Distribution of Energy

VOLUME XXVIII SAN FRANCISCO, MARCH 30, 1912 NUMBER 13

[COPYRIGHT 1912 BY TECHNICAL PUBLISHING COMPANY]

A MODERN MUNICIPAL WATER WORKS

Among the many municipal water supply systems which have been installed recently in the smaller towns of California, that of the city of Corning is worthy of discussion as being a well designed typical plant. The town of Corning has a population of about 2,000, and the system is planned to give reliable service to these, to give adequate fire protection to property, and to conveniently allow future additions.

The supply of water is obtained from three bored wells at an average depth of 150 ft., and cased with 10 in. diameter double No. 16 gauge galvanized well casing. They are situated about 50 ft. apart, so that each will be out of the zones of influence of the others. A combined flow of approximately 2000 gals. per min. is obtained, the water being clear, fairly soft and of pleasant taste. When full quantity of water is being pumped the water level will be reduced from the normal of 8 to about 20 ft. The top of each well casing terminates in a concrete pit, 3 ft. in diameter and 10 ft. deep, this being the same depth as the pump pit. Separate 6 in. suction pipe runs horizontally from the bottom of each well pit and connects with a gate valve inside of pump pit to an 8 in. suction manifold from which the pumps take their supply. Any well, therefore, can be put into or out of service at will from inside the pump house. The suction pipes extend 35 ft. down into each well, creating a tendency to draw from the lower gravel strata rather than from the upper.

Corning Pumping Plant and Tank.

The pump house is a fire-proof structure, the walls being of brick and the roof of corrugated iron, so that there is no possibility of interruption of service being caused by fire. The house surmounts the pump pit, which is 18 ft. by 28 ft. and 10 ft. deep. The walls are 12 in. thick of concrete reinforced, and thoroughly water-proofed with a layer of felt in the concrete. On the bottom of this pit set the pumping units. This places the pumps at the water level of the wells so that there is no suction left, which is a condition desirable for the best operation of centrifugal pumps.

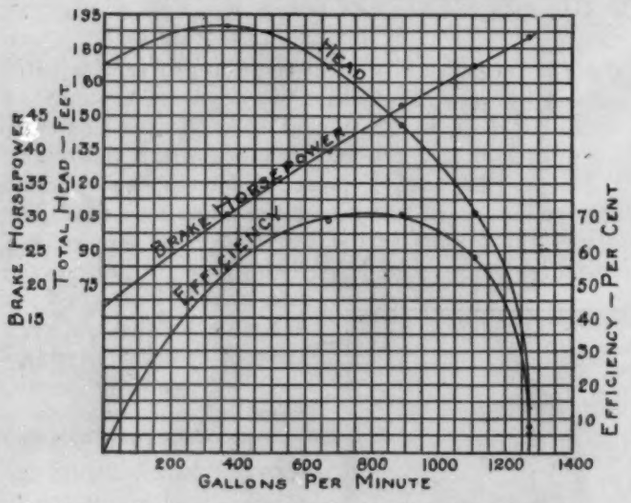
The general service pumping unit consists of an Alberger 6 in. 2-stage, turbine type, centrifugal pump, direct connected to, and mounted on a common cast iron base with a General Electric induction motor, operating at a constant speed of 1200 r.p.m. The pump embodies all the features of the most modern and approved design, including bronze impellers and water passages, ring oiling bearings, water sealed stuffing boxes, and water cooled thrust bearing, so that the upkeep and attention required are practically nil.

The motor is of the squirrel cage type, rated at 50 h.p., with an overload capacity of 25 per cent for two hours, and operates on 2200 volt, 3-phase, 60 cycle current. The only wearing part of such a motor is the ring oiling bearing on the shaft, and the upkeep is negligible.

The normal rating of the unit is a delivery of 800 gals. per min. against a total head of 150 ft. with a pump efficiency of 68 per cent. Under test this efficiency was exceeded by 3 per cent, as shown by curves. The pump may discharge equally well into the tank or into the mains. By reference to the curves, it will

be seen that the characteristics of the pump are such that at no point over the entire range of discharge can the pressure exceed the normal by more than 15 per cent. The pump is absolutely automatic in this respect, and no dangerous pressure can possibly be developed on the water mains. By studying the power curve it will be seen that under no conditions can the load on the motor exceed the normal by more than 25 per cent, so that the motor and other electrical equipment can never be loaded above their overload capacity. It will thus be seen that such a unit is absolutely fool-proof, without the aid of relief valves or other protecting devices.

The fire service pumping unit consists of an Alberger 8 in. 3-stage underwriters turbine fire pump,



Characteristic Curve Alberger 6 in. Two-Stage Turbine Pump Operating at Constant Speed 1160 r.p.m.

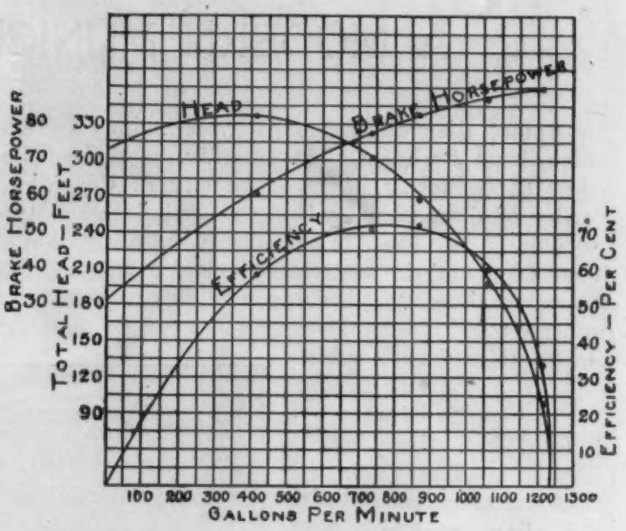
driven by motor operating at a synchronous speed of 1200 r.p.m., the general design of the unit being in all respects similar to that of the service unit.

The motor is rated at 100 h.p., with overload capacity of 25 per cent for two hours.

The normal rating of this unit is to deliver 800 gals. per min. against a total head of 125 lb. per sq. in. (290 ft. head water), with a pump efficiency of 70 per cent (73 per cent by test). This pump has characteristics similar to those of the service pumps, and may discharge into either mains or tank. By studying the curve it will be seen that the pump will throw 3 1/5 good fire streams at the normal rated head of 125 lb., or if required 2 good streams at 145 lb., or 4 good streams at 105 lb., or 1200 gals. per min. or 59 per cent capacity increase into the tank at 65 lb. pressure; all automatically. Such flexibility is of great advantage in fighting fires, and it will be readily seen that it would be practically impossible to obtain these results with any type of plunger pump. The efficiency of this pump, 73 per cent, while not quite as high as would be shown by a triplex pump under test, would be maintained in actual service, whereas leaky valves, poorly packed stuffing boxes and general wear would reduce the efficiency of the triplex to a much lower figure.

A 5 by 5 in. geared plunger pump is provided to discharge all drainage from a small sump in the corner of the pump pit and is to be used in emergency for priming the centrifugal pumps. A 3 h.p., 110-volt, 3-phase, belt driven, induction motor operates this outfit.

Electrical energy at 22,000 volts is available from two companies, and connection is made to both through a double throw oil switch in the pump house, thus insuring continuity of service, which from the standpoint of fire protection at least is important. Independent oil switches and starting compensators for each motor are mounted on slate panels on the pump pit wall. Transformers to step down the electrical energy supply from a voltage of 22,000 to 2200 are located outside of the pump house.



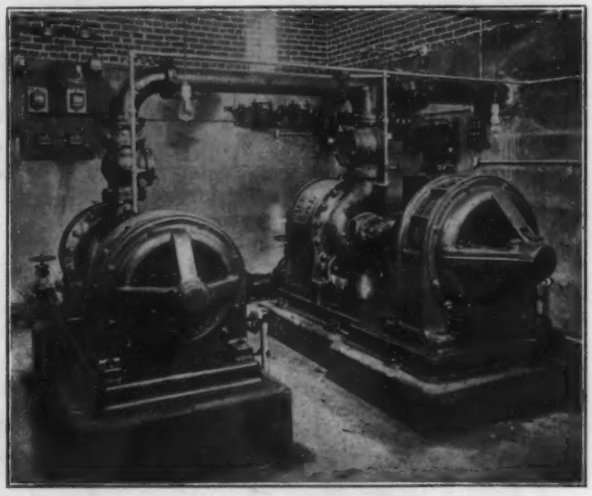
Characteristic Curve Alberger 800 r.p.m. Uuderwriters' Turbine Fire Pump, Operating at Constant Speed 1160 r.p.m.

To provide an adequate reserve supply of water at all times, a 100,000 gallon tank on a 100-foot tower has been constructed, the entire structure being of steel. Each of the four legs of the tower rests upon concrete footings, having 12 ft. by 12 ft. bearing area. On these is supported the tank, which is 22 ft. in diameter, 28 ft. deep, with hemispherical bottom 11 ft. radius. Surmounting the roof is a conical roof, which in addition to keeping out birds, dust, etc., gives a pleasing, finished appearance to the structure.

In the design of the distributing system the three important considerations given attention were: 1st, the delivery of water to all parts of the town without undue loss of pressure; 2d, flexibility and consequent reliability, and 3d, possibility of future extensions.

To avoid long lines of small pipe which do not fulfill any of the above conditions an 8 in. circulating loop is run around the main section of town, and the area thus inclosed is again divided into four parts by 8 in. cross town mains. The 8 in. discharge main from the pumps to the tank crosses this loop line at right angles so that by means of 4 gate valves, one on each side of the cross mains, tank and pump can be connected as desired. Four-inch lines extend down the various streets and alleys between these 8 in. mains. All lines in the central part of town, therefore, receive supply from two directions and since all runs are valved, any section may be cut out without interruption of service to the other sections. Also by this

arrangement all 4 in. runs are comparatively short and excessive loss of pressure is prevented. In the layout of the system in the outer parts of town the same principles were, as far as practicable, observed,



Motor Driven Pumps.

viz: circulating loops and no long runs of small pipe. Hydrants to meet the requirements of fire underwriters are liberally located throughout the city. The appropriation available for this work limited the selection of pipe to steel, and steel casing with lead joints was adopted. This was asphalt dipped at the factory and carefully retouched after being laid, so

Laying Pipe.

reasonable life may be expected. The system comprises approximately 2,000 ft. of 10 in. pipe, 1200 ft. of 8 in. pipe, 14 ft. of 6 in. pipe, 22,000 ft. of 4 in. pipe, together with valves, hydrants and fittings. The cost of the entire installation was about $50,000. P. J. Newton was the engineer in charge of the work for the city of Corning, and C. F. Braun & Co., mechanical engineers and contractors, of San Francisco, were contractors for the entire work.

THERMOMETER CORRECTIONS.

In general, all corrections are determined for total immersion, that is, for the condition where both bulb and stem are at the same temperature. If, however, the stem emerges into space, either warmer or cooler than the bulb, a stem correction must be applied to the observed reading in addition to the one given in the accompanying table.

This so-called stem correction is often important in the case of thermometers used for differential temperature measurements, as is calorimetry.

In this case, the correction may be computed from the following formula involving the difference of the initial and final reading:

$$\text{Correction} = Kd\ (T_1 + T_2 - S - t)$$ where

K = factor for relative expansion of glass and mercury, 0.00015 for Centigrade thermometers, and 0.000085 Fahrenheit thermometers.

d = $T_2 - T_1$, where T_1 and T_2 are the initial and final readings.

S = scale reading to which the thermometer is immersed.

t = temperature of emergent stem, measured by means of an auxiliary thermometer.

This correction must be applied (added if +, subtracted if —) to the difference of the readings to give the true difference of temperature.

For Example.—Suppose the thermometer was immersed to its 65° mark; its initial reading, T_1, was 67°; its final reading, T_2, was 87°; and the stem temperature was 75°. Then the correction is $0.000085 \times 20\ (67 + 87 - 65 - 75) = .02$. The difference between T_1 and T_2, each corrected from the accompanying table, is 20.05°. The true difference between the initial and final temperatures is $T_2 - T_1$ + correction, 86.98° — 66.93° + .02 = 20.07°.

MAXIMUM DEMAND RATE SCHEDULE AT PORTLAND.

The Portland Railway, Light & Power Company has announced a new rate schedule effective after July 1, 1912, based on the consumer's maximum demand. The first 6 per cent of maximum lighting consumption is to be charged at 9 cents per kw. hour, the next 6 per cent at 7 cents and the excess over 12 per cent at 4 cents. Discounts for quantity will be allowed at the rate of 1 cent per kw. hour for monthly consumption in excess of 1000 kw. hours, with an additional 1 cent discount per kw. hour for monthly consumption in excess of 3000 kw. hours.

The power rates for installations of moderate size is to be 7 cents for the first 4 per cent, 5 cents for the next 4 per cent and 2 cents for the excess over 8 per cent. A discount for quantity will be allowed at the rate of 1 cent per kw. hour for monthly consumption in excess of 1500 kw. hours. For wholesale power the rate will be $1.25 per kilowatt of demand per month plus the following charges per kw. hour delivered:

First 1000 K.W.H. at 2c	Next 16,000 K.W.H. at 8 Mills
Next 2000 K.W.H. at 1½c	Next 32,000 K.W.H. at 7 Mills
Next 4000 K.W.H. at 1¼c	Next 64,000 K.W.H. at 6 Mills
Next 8000 K.W.H. at 1c	Over 127,000 K.W.H. at 5 Mills

ELEMENTS OF HYDRAULIC ENGINEERING

DEVELOPMENT OF THE TURBINE.

(Continued)

BY GEO. J. HENRY, Jr.

The further development of the Fourneyron turbine was taken up by Boyden in New England and the mills of that section were extensively equipped with Boyden's wheels during the period from 1844 to 1860. See Fig. 11. These turbines were of the radial outward flow type.

The Borda wheel, previously described, suggests the form of turbine later introduced by Henschel in 1837, but further developed and introduced by and now generally known by the name of Jonval. Its use

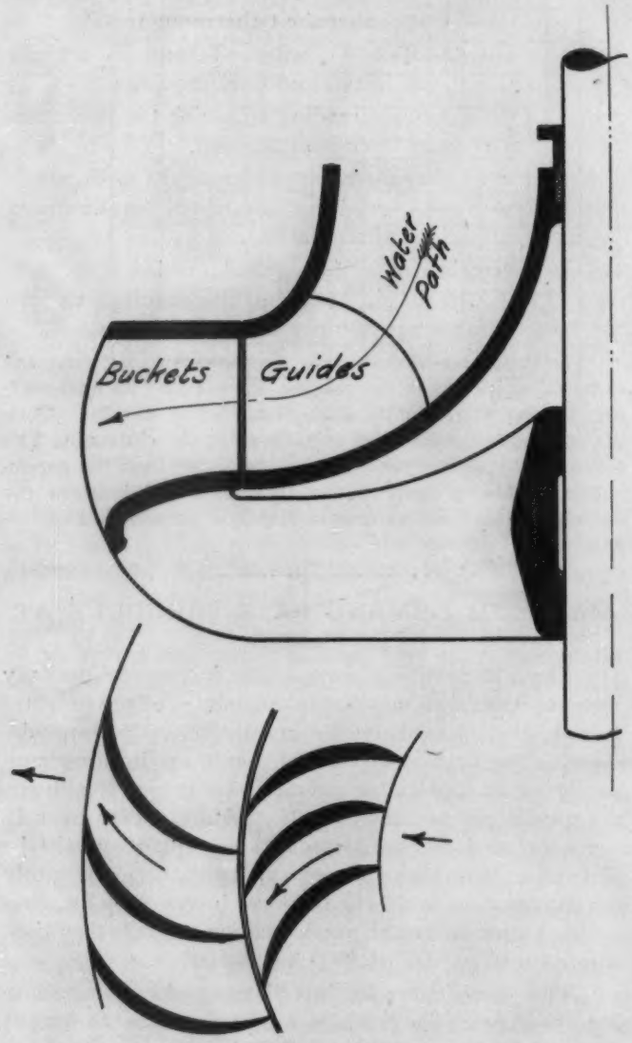


Fig. 11. Boyden Type of Fourneyron Turbine, Radial Outward Flow.

in this country was due mostly to the efforts of Morris & Geyelin of Philadelphia about 1855 and shortly thereafter. It is what is known as a parallel downward flow turbine and is shown diagramatically in Fig. 12.

Quite a few installations of Girard turbines have been made and up to about 10 years ago this type seemed to be gaining quite a foothold. Although the principles of the Girard turbine appear quite simple, and from the standpoint of mathematics the runner and guides appear quite efficient, there are a number of mechanical difficulties which preclude its satisfac-

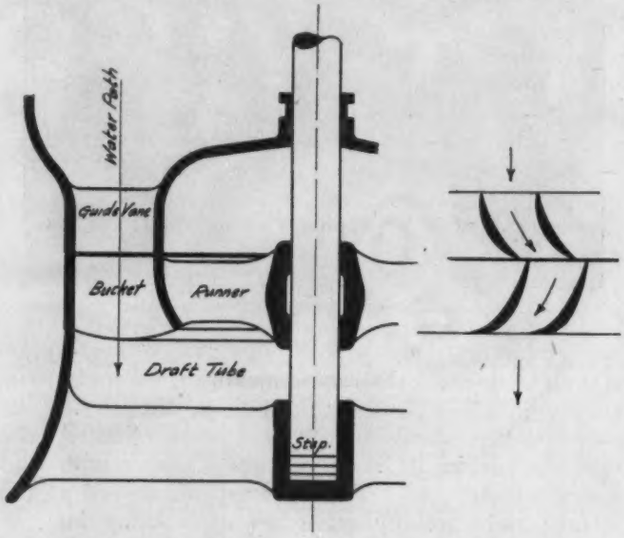


Fig. 12. Jonval Type of Turbine, Parallel Downward Flow.

tory application in most cases. The Girard is properly speaking an impulse wheel although generally spoken of as a turbine, probably because of its European origin. It is shown diagramatically in Fig. 13.

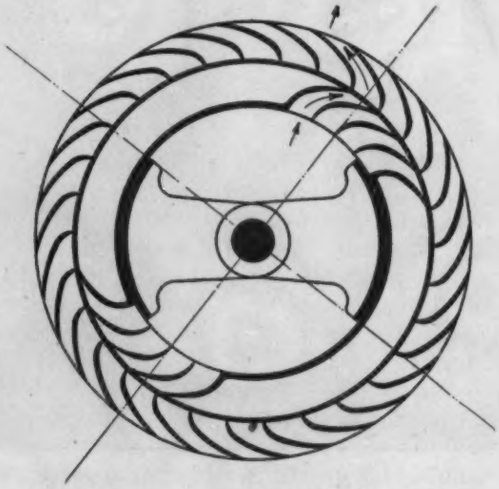


Fig. 13. Girard Type Turbine, With Center Water Entrance.

Considering any pair of guides and buckets and the water action through them, the efficiency should be quite equal to that of the Fourneyron, but this turbine was especially designed for high heads and therefore but a comparatively few water passages were used around the circumference. The gate, by partial rotation, cuts out of action one or more of

the guide passages, after which the buckets must fill with water or air or by the vacuum effect, eddy currents will ensue disastrous to the wearing qualities, efficiency and regulation.

The gate is usually arranged to control a series of inlets on each side, thus, in a measure, balancing the water thrust on the guide ring and runner. But, as the pressure is not constant around the circle, there is a tendency to deform the circular shapes. Under high pressure and large sizes this is very great. The strains in the gate sectors are also severe and the friction between the gate and guide ring such as to make a powerful governor necessary. Even then the movement is not positive and accurate, bringing about a probable hunting effect in the governor action in its effort to make the gates register accurately. As the water does not enter the guide passages radially over the edges of the gate sectors its velocity component in the direction of gate movement also makes necessary a large power capacity in the governor.

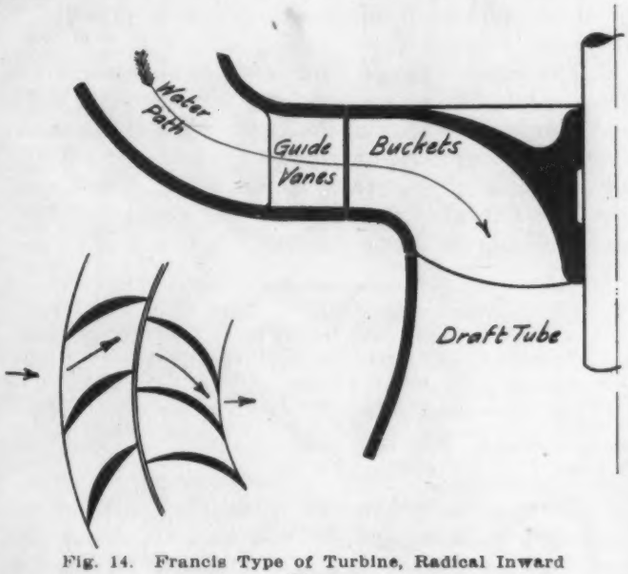


Fig. 14. Francis Type of Turbine, Radical Inward Flow.

The reduced area of the water passages in approaching the guides imposed by the limitation of wheel diameter, frequently introduces considerable loss. The discharge chamber, where the velocity should be low, must also be quite large and surround the entire wheel, making the vacuum more difficult to maintain, and compelling that most of the working parts be inside.

It is due mostly to these structural limitations that the Girard wheel has found so little favorable application. Likewise the readiness with which they may be and have been overcome in the modern design of the Francis turbine has secured so favorable a reception for the latter.

The Francis Turbine.

In the radial inward flow type, which is now being so extensively used under the name of the Francis turbine the water enters from the outside, passing radially through the buckets and turning axially in its passage while still in the runner, or immediately on its discharge therefrom as shown in Fig. 14. The inward flow feature of this turbine was patented by Samuel D. Howd in 1836. But as the water cannot be discharged tangentially because of interference with other approaching buckets and on account of the considerable velocity retained in the water discharged from the inside edge of the buckets, this form has not been extensively used alone but has been combined with the axial flow feature to make the modern Francis runner. It will be noted that the direction of water flow in the Girard wheel mentioned above is just the reverse of that in this wheel.

The earlier forms of turbine wheels were generally mounted on vertical shafts and the wheels set in the bottom of penstocks of wood and in some of the later and larger installations of concrete. This form of construction required much less machine work,

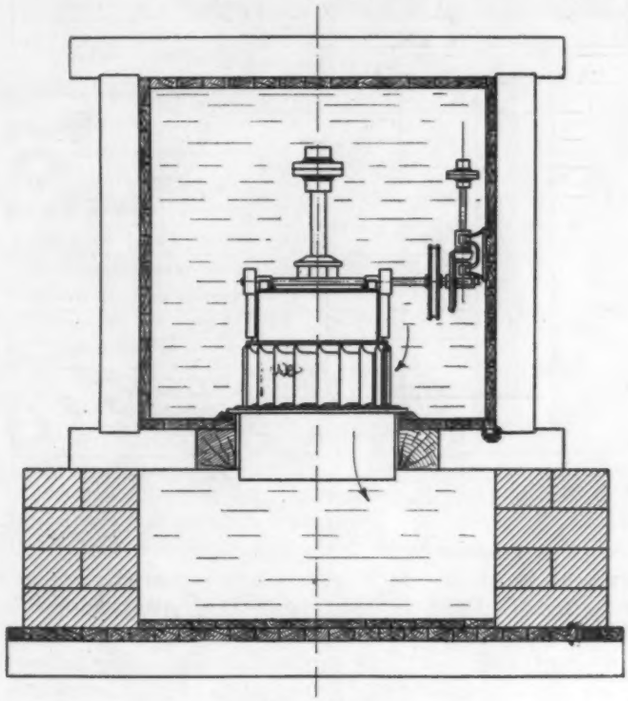


Fig. 15.

which was indeed usually limited to that found in an ordinary foundry, and the balance of the work was done at the site where the power was to be developed. See Fig. 15.

Only in recent years in this country has the entire turbine unit, consisting of the runner, the casing, shaft and bearings, gate rigging and governor apparatus all been designed and built in a scientific manner by one engineering organization and high class machine works and there has been a strong tendency toward horizontal shafts and the elimination of gears or other forms of transmission.

This course has concentrated experience and experiment in channels where it has been most readily available for application to further building and perfecting of turbines and has resulted in establishing turbine practice in America on a scientific basis.

Prime Mover Efficiencies.

Based on the potential energy in nature's supply, the modern high pressure Francis turbine and best forms of tangential wheel installations afford a higher

percentage of energy transformed from the primary source into useful work than any other recognized commercial prime mover.

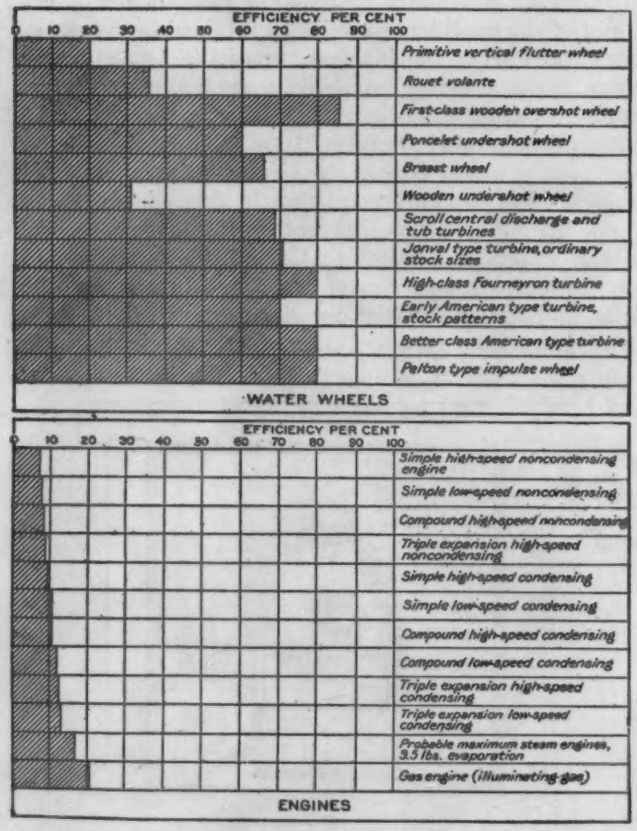

EFFICIENCY PER CENT
0 10 20 30 40 50 60 70 80 90 100
Primitive vertical flutter wheel
Rouet volante
First-class wooden overshot wheel
Poncelet undershot wheel
Breast wheel
Wooden undershot wheel
Scroll central discharge and tub turbines
Jonval type turbine, ordinary stock sizes
High-class Fourneyron turbine
Early American type turbine, stock patterns
Better class American type turbine
Pelton type impulse wheel
WATER WHEELS
EFFICIENCY PER CENT
0 10 20 30 40 50 60 70 80 90 100
Simple high-speed noncondensing engine
Simple low-speed noncondensing
Compound high-speed noncondensing
Triple expansion high-speed noncondensing
Simple high-speed condensing
Simple low-speed condensing
Compound high-speed condensing
Compound low-speed condensing
Triple expansion high-speed condensing
Triple expansion low-speed condensing
Probable maximum steam engines, 9.5 lbs. evaporation
Gas engine (illuminating gas)
ENGINES

Fig. 16. Comparison of Efficiencies of Various Types of Prime Movers.

A comparison of the efficiencies obtained with various types of water wheels and steam engines as reported by Robt. E. Horton of the U. S. Geological Survey in 1906 may prove of interest as shown in Fig. 16. But this would be somewhat misleading in the case of an hydroelectric plant unless the effect of the

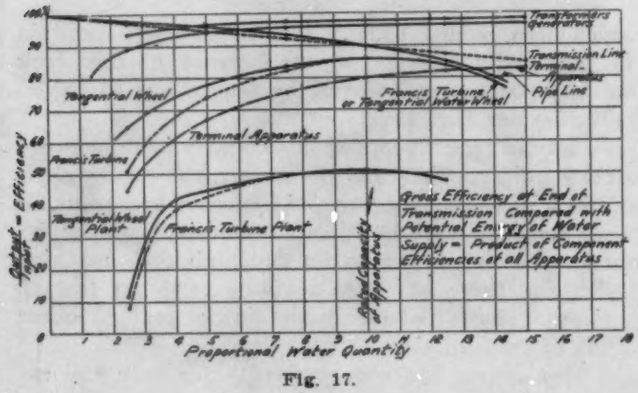

Transformers Generators
Transmission Line Terminal Apparatus Pipe Line
Tangential Wheel
Francis Turbine or Tangential Water Wheel
Terminal Apparatus
Francis Turbine
Tangential Wheel Plant
Francis Turbine Plant
Gross Efficiency at End of Transmission Compared with Potential Energy of Water
Supply = Product of Component Efficiencies of all Apparatus
Output = Efficiency
Proportional Water Quantity

Fig. 17.

station load factor and the transformation and transmission losses taken into account. The losses at fractional loads in the water wheel and associated apparatus would have a material influence on the values given in this table and an approximation of what may be expected is given in Fig. 17. The losses in a modern well equipped steam plant will occur about as follows:

	Per cent.
Energy units in oil or coal	100
Energy delivered at engine throttle	40 to 50
Energy rejected to condenser less energy recovered	30 to 35
Mechanical energy delivered on engine shaft	10 to 15

This may be readily seen by the fact that it is a very high grade steam plant that will deliver 250 kw. hours from a barrel of oil which contains 336 pounds of oil and 18,500 B.t.u. per pound. An average barrel of good oil therefore contains 6,216,000 B.t.u. and as 3412 B.t.u. correspond with a kw. hour we have 1820 kw. hours theoretically in one barrel of fuel oil, which, divided by the 250, obtained gives 13.7 per cent efficiency for the combined steam and electric generator. Allowing 95 per cent as the efficiency of the electrical apparatus we have 14.4 per cent as the gross efficiency of the steam plant.

In considering these figures, however, it must be borne in mind that the mechanical efficiency of the steam engine as a machine is high and that the principal losses are inherently thermal and in no way attributable to the mechanical design of the engine or steam turbine itself, however directly associated they may be with it.

The possibilities of some other forms of heat engines, while having some points to recommend them and having from time to time gained the enthusiastic support of engineers, have never been able to materially encroach on the steam engine field.

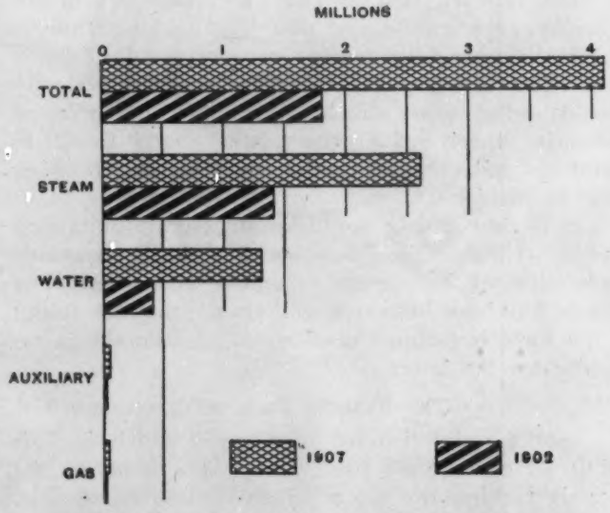
The following figures from the census of 1905 and 1907 may be of interest:

Table 1.

	1905	1900	1890	1880	1870
	Owned and rented power.			Owned power only.	
Steam power	10,828,111	8,140,533	4,662,029	2,185,458	1,215,711
Increase	33%	74.6%	113.3%	79.8%	
Water power	1,647,969	1,454,229	1,263,343	1,225,379	1,130,431
Increase	13.3%	15.1%	3.1%	8.4%	
Electric power	1,592,483	493,223	15,569		
Increase	222%	3.068%			

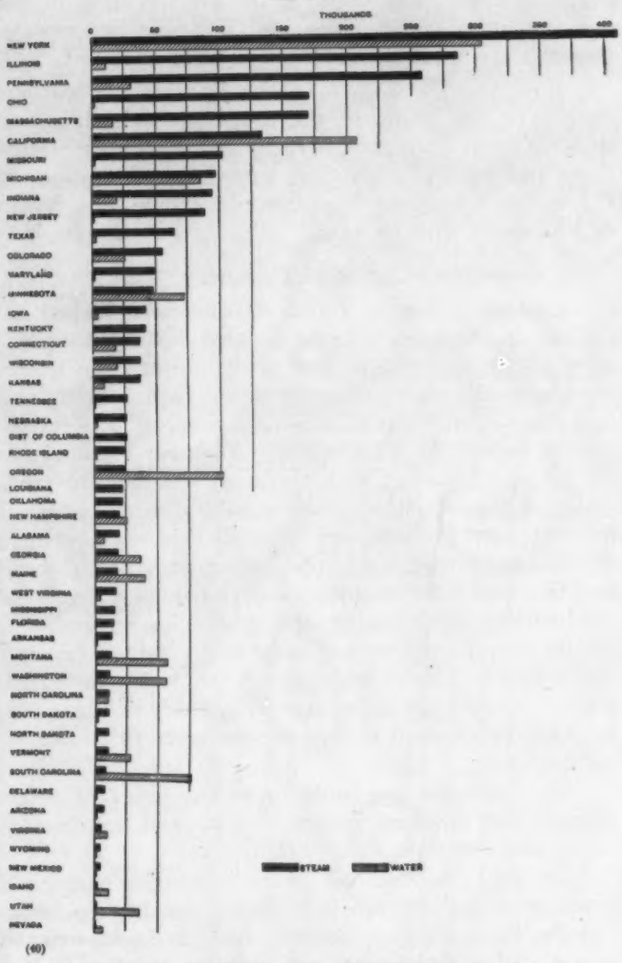
These statistics are reported by the U. S. Census Bureau in Bulletin No. 88, 1907, and in a special report on central stations. "The statistics in Table 1

TABLE II.



Millions of Horsepower Installed in United States. Central Stations in Steam and Water Power Plants—1907.

TABLE III.



Thousands of Horsepower in Steam and Water Power Central Stations Arranged by States in the Order of Their Relative Importance.

can hardly be considered as accurate, as water power transmitted and utilized electrically is reported elsewhere as electric power by manufacturing establishments."

"Steam has contributed more than any other kind of power to the great increase, 1,247,509 horsepower, in the primary power of central stations, and the steam turbine, which was first reported separately in this industry at the census of 1907, has become a very important factor in the electrical generating equipment. Water is used as the primary power in a constantly increasing number of stations, and the power of the wheels increased by 910,615 horsepower during the five years ending with 1907. Although the greatest absolute increase was shown for steam power, in percentage of increase, it was surpassed by both gas and water power. The percentages are: Steam power 90.4 per cent; water power, 207.7 per cent; and gas power 358.3 per cent."

The figures are here quoted as indicating rather the rate of growth in power and the strong tendency to electrical power use, in the original development of which water power comes in for a large share. Electric transmission did not come into existence until about 1895 and for twenty years before, the growth of cities following the line of least resistance in transportation facilities rather discouraged the development of the isolated water power in favor of the steam engine.

Analagous to the losses associated with the steam engine we have the head losses applicable in water wheel practice and we might with equal justice charge up the reservoir, canal or flume losses of leakage, seepage and evaporation after the water is taken from its natural channel. These being almost constant, however, are not usually considered in this way but appear as increased cost of development of the power per unit delivered at the power house. The losses in the conduits and in fact up to the water wheels, while nearly constant under any fixed load for a particular plant, vary greatly between different plants, although they usually represent only a small percentage of the total power involved. Fig. 17 is given for the purpose of making this clearer and must not be considered other than as a general approximation.

It is obvious that if we are dealing with a low head development and must have a long flume for the water supply, say 10 miles, and have a drop of 125 ft. surveyed and a slope in the flume of 1 in 2500 this corresponds with a constant loss of 21 per cent due to the slope only and results in amortization charges that must be carried by the 104 ft. remaining. Losses also at the pipe inlet and due to pipe friction will probably further reduce this to 100 ft. effective at the water wheels.

The high efficiencies of turbine water wheels, while for many years obtainable under laboratory conditions as in the Holyoke testing flume and on small size sample runners, were often not found to exist when the runner was assembled in its casing and put into commercial operation, and especially was the efficiency found to be low when operated at partial gate. Improvements in the approach passages to the runner and discharge passages and draft tubes have been of greater importance in recent years than in the runner itself. And it will be seen later that the same also applies in tangential wheel practice.

Influences Affecting Turbine Design.

The use of the spiral casing, the form of the wicket gates, and the changing of the water direction on a minimum degree of curvature and at gradually increasing velocities until it enters the runner and gradually reducing velocities during its descent through the draft-tube mark the principal steps in the general design; and combined with a careful study of the mechanical elements involved have put the Francis turbine on its present high plane of excellence.

The advent of electrical measurements has greatly facilitated this by enabling the turbines to be tested in place and up to full gate capacity, thus enabling the purchaser to definitely determine just what he was getting and the manufacturer to "sift the chaff from the wheat" and further improve each consecutive piece of apparatus.

The interests of electric transmission companies, whose primary object was of course the marketing of electric energy largely in competition with existing steam or other hydraulic plants, early came to demand a high efficiency from the apparatus, as this meant

additional power; the gross plant efficiency being in fact the proportional measure of the amount of power the company could market from a given investment. Also most important was it that customers be satisfied with the electric power service supplied them by the transmission company. The user would not be responsible for interruption in the service, however caused, and such interruptions became a direct charge in dollars against the power company. If therefore an additional expenditure by the power company would secure more kilowatts to sell from a given investment or reduce the investment in development for a given electric power output, or would secure apparatus

Fig. 18. Plant of Niagara Falls Hydraulic & Manufacturing Company.

susceptible of more reliable operation, then such extra expense was a logical investment in the purchase of their apparatus. The path was sometimes blocked by water wheel builders not having an engineering organization or shop equipment adequate to meet the demands, and high class builders were frequently confronted with competition with inferior products, and often too the purchasers were lacking in the proper knowledge or discernment to appreciate the value of the superior product involving higher first cost. But the general trend during the last twenty or thirty years has been rapid along the lines of improvement.

A good example of the replacement of older turbines by higher class modern apparatus and electric transmission is that which has taken place in some of the plants at Niagara Falls. In the lower foreground of Fig. 18 is shown the plant of the Niagara Falls Hydraulic & Manufacturing Company, where an output of 35,000 h.p. was obtained from the canal that originally (with earlier turbines) supplied but 10,000 h.p. The canal was increased 50 per cent in depth, but by utilizing the entire head, 210 ft. in this case, more than double the output was easily obtained. This is a case of intelligent engineering application. It is probable that not more than a few per cent efficiency difference, if any, would have been shown in any Holyoke test of the runners of the new stations over the older ones, and yet the conservation of the investment in canal, pipes and building per unit of power, thus made available, is at once apparent.

It is then, not only to the lines of the turbine runner or the shape of the tangential wheel bucket that we must give careful study but in the associated parts and general adaptation to existing conditions of the entire apparatus if we would crown our power development with success.

Choice of Turbine.

One of the most frequent questions asked is, "What is the best type of turbine for me to use?" and a little thought will at once indicate the necessity for a full understanding of the requirements and local conditions before this question can be intelligently answered. The quantity of power to supply to the proposed market with a careful study of the daily and yearly load curve; the probable future needs; is the water supply sufficient to meet this with or without storage throughout the year; under what head can the water be utilized with the most economical headworks, canal, piping and power house, and will we be able to utilize a draft tube within safe draft limits and still keep the power house well above high water? Only a careful engineering study of these preliminary points will enable the engineer to advise intelligently.

This reduces the problem to the point of determining the power, capacity, speed and number of units, and the type to be adopted.

During the past few years it has become good practice to build Francis turbines for higher heads and the limit does not seem to have been approached as yet. Where ten years ago large units were seldom built for 200 ft. head, we find today 500 ft. is even more common. This has been brought about by a gradual increase and careful study of the results at each consecutive step.

The capacity of a single unit ten or twelve years ago was 500 to 1000 h.p. whereas today it is 10,000 kw. with a strong tendency to still further increase the size.

A third variable that the water wheel designer has had to contend with has been the constantly increasing speeds of electric machinery.

The development of the steam turbine has placed upon the market a large number of high speed standand design generators whose first cost was much less per unit of power on account of these high speeds and reduced weight of material.

The purchaser of hydraulic apparatus is therefore interested in obtaining the highest head, the largest capacity (and therefore the fewest units in the power house) and the highest speed units consistent with good practice and the economical use of the units with reference to the daily load curve.

It is safe to say that among manufacturers there are some who will recommend higher speeds or heads and offer higher guarantees in their anxiety to sell apparatus than would other conservative builders, and such recommendations must not be confused with any ability on their part to build better apparatus or that they are better able to meet such promises or secure

better operating results. It is not the automobile that would be guaranteed for the highest racing speed that necessarily would meet such speed under commercial conditions or which was cheapest in first purchase price that would be the best investment for the purchaser, nor would one that burned the minimum gasoline under test—but one that meets the commercial speed and has the least gasoline consumption over several thousand miles, the least tire wear and above all the minimum total maintenance and depreciation.

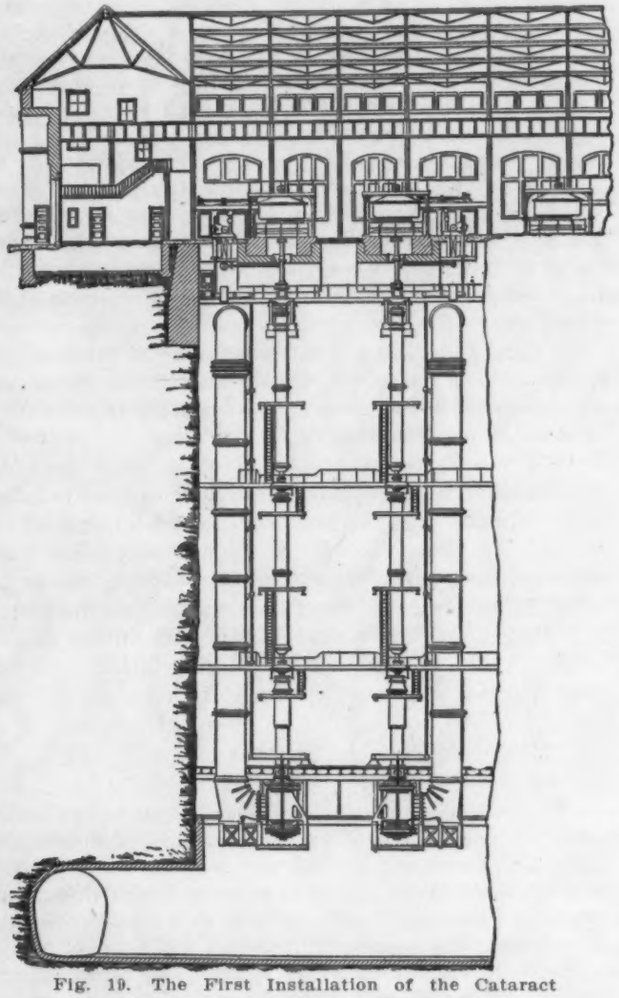


Fig. 19. The First Installation of the Cataract Construction Co. at Niagara Falls, 1892-3.

Thus it is with turbines. The greatest number of kilowatt hours from the water available with the least fixed charges and maintenance, and the best regulation is what the purchaser wants, and also rigidity of the apparatus and the proper distribution of material (the heaviest equipment is not by any means necessarily the safest or best) is essential to service quality as well as efficiency and output.

The cost of the water wheel apparatus is as mentioned before, but a very small fraction of the total investment in the plant, and the entire investment is for its success so absolutely dependent on the success of the water wheel apparatus that for a few per cent of the total investment the very best construction instead of an inferior one can be purchased, thus obtaining the best permanent insurance for a small first cost only; such purchase is certainly the wise one to make.

As to the type of turbine unit as regards the arrangement of the several parts, casing, runner, shaft, bearings, draft tube there are of course limitations in each instance, but generally speaking there are several different ways in which each form of mounting can be put together.

Today, Francis turbine practice is tending rapidly toward the elimination of the flume and cylindrical casing mounted wheels and toward the almost universal use of spiral casings. Also the tendency toward the entire elimination of working parts from within the water chamber, that is all the gate operating mechanism and bearings must be exposed for lubrication, care and inspection, and needless to say the usual effort is to direct connect the driving and driven machinery. A discussion of the details of construction of the several types, their limitations and advantages, will be given in a later article.

Between the building of the Cataract Construction Company's plant in 1893 and the present day, the progress has been most rapid and it has been characterized by the replacing to a very large degree of other forms of turbine by the improved forms of the Francis. For example in the first installation by the Cataract Construction Company at Niagara for the electrical transmission of a considerable power, the board of engineers made use of the Fourneyron type of wheel which gave a very high efficiency, but the loss of draft, the deep and expensive wheel pit and the maintenance of the long wheel shaft (See Fig. 19), together with other considerations has led later companies to adopt a different design. In the case of the Ontario Power Company this is evident in setting the power house near the river below the falls. Aside from the damage possible from high water in the Niagara River (and which occurred once since the plant was installed) this gives a more convenient and efficient arrangement of apparatus.

Although it is very difficult to foresee all the accidents that may occur, it is of course one of the functions of the hydraulic engineer to anticipate and guard against them as far as possible.

BRITISH COLUMBIA TELEPHONE RATES.

There has been much discussion in Victoria in regard to the proposed increase of telephone charges by the British Columbia Telephone Company.

The new rates for Victoria and Vancouver to go in effect April 1, 1912, are as follows: For unlimited telephone service to business houses a monthly rate of $5 net will be charged, an increase of $1 per month; for the man of small business who has few calls a rate of $3 for the first 100 outgoing calls will be made, and for each additional call a charge of 2 cents. The residence rates are $3 for individual and $2 for two-party lines, the same as before.

The long-distance charges are: From Victoria to Nanaimo, for first two minutes, 50 cents; each additional minute, 20 cents each. From Victoria to Cumberland, 90 cents for two minutes, and 40 cents each additional minute. From Victoria to Vancouver, 60 cents per minute.

WESTERN LAWS OF ELECTRICITY AND WATER

EARLY DEVELOPMENT OF THE DOCTRINE OF APPROPRIATION.

BY A. E. CHANDLER.[1]

The doctrine of appropriation is one recognized in the law of waters as governing a class of rights markedly distinct from the riparian rights of the common law. It grew out of the occupancy of the public domain during the mining period and is not accepted outside of the western mining and irrigation States. Although of so recent origin as far as our own people are concerned, the following quotation from Clough v. Wing (2 Ariz. 371) shows its long standing in America:

> And the right to appropriate and use water for irrigation has been recognized longer than history, and since earlier times than tradition. Evidences of it are to be found all over Arizona and New Mexico in the ancient canals of a prehistoric people, who once composed a dense and highly civilized population. These canals are now plainly marked, and some modern canals follow the track and use the work of this forgotten people. The native tribes, the Pimas and Papogos and other pueblo Indians, now, as they for generations have done, appropriate and use the waters of these streams in husbandry, and sacredly recognize the rights acquired by long use, and no right of a riparian owner is thought of. The only right in water is found in the right to conduct the same through their canals to their fields, there to use the same in irrigation. The same was found to prevail in Mexico among the Aztecs, the Toltecs, the Vaquis, and other tribes at the time of the conquest, and remained undisturbed in the jurisprudence of that country until now. Clough v. Wing, 17 Pac. 453.

As was to be expected from the great rush to the gold fields following the discovery in January, 1848, legal controversies early arose not only in regard to the mining claims but also in regard to the ditches and water rights used in connection therewith. One of the very early cases often quoted is Irwin v. Phillips (5 Cal. 140) decided in 1855 and the following extract from the opinion clearly shows the necessity for the doctrine of prior appropriation:

> Courts are bound to take notice of the political and social condition of the country which they judicially rule. In this State the larger part of the territory consists of mineral lands, nearly the whole of which are the property of the public. No right of intent of disposition of these lands has been shown either by the United States or the State governments, and with the exception of certain State regulations, very limited in their character, a system has been permitted to grow up by the voluntary *occupation* of the mineral region has been *tacitly assented to* by the one government, and heartily *encouraged* by the expressed legislative policy of the other. If there are, as must be admitted, many things connected with this system, which are crude and undigested, and subject to fluctuation and dispute, there are still some which a universal sense of necessity and propriety have so firmly fixed as that *they have come to be looked upon as having the force and effect of res judicata.* Among these the most important are the rights of miners to be protected in the possession of their selected localities, and the rights of those who, by prior appropriation, have taken the waters from their natural beds, and by costly artificial works have conducted them for miles over mountains and ravines, to supply the necessities of gold diggers, and without which the most important interests of the mineral region would remain without development. So fully recognized have become those rights, that, without any specific legislation conferring or confirming them, they are alluded to and spoken of in various acts of the legislature in the same manner as if they were rights which had been *vested* by the most distinct expression of the will of the lawmakers * * * This simply goes to prove what is the purpose of the argument, that however much the policy of the State, as indicated by her legislation, has conferred the privilege to work the mines, it has equally conferred the right to divert the streams from their natural channels, and as these two rights stand upon an equal footing, when they conflict, they must be decided by the fact of priority, upon the maxim of equity, *"Qui prior est in tempore, potior est in jure."*

Elsewhere in the above mentioned opinion it is stated:

> It must be premised that it is admitted on all sides that the mining claims in controversy, and the lands through which the stream runs and through which the canal passes, are a part of the public domain, to which there is no claim of private proprietorship.

The miners and others were but trespassers on the public domain as Congress had passed no legislation recognizing their claims. It is not surprising that a movement gained weight in the Eastern States to have the government assert its ownership to the mines and ditches and other developed works on the public lands. As far as the West is concerned, therefore, the then critical situation was happily relieved by the passage of the famous Act of 1866 which is now Section 2339 of the Revised Statutes of the United States and reads as follows:

> Whenever, by priority of possession, rights to the use of water for mining, agricultural, manufacturing, or other purposes, have vested and accrued, and the same are recognized and acknowledged by the local customs, laws and decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same; and the right of way for the construction of ditches and canals for the purposes herein specified is acknowledged and confirmed; but whenever any person, in the construction of any ditch or canal, injures or damages the possession of any settler on the public domain, the party committing such injury or damage shall be liable to the party injured for such injury or damage.

In 1870 the section which is now Section 2340 of the Revised Statutes and which is generally construed with Section 2339, was passed. It is as follows:

> All patents granted, or pre-emption or homesteads allowed, shall be subject to any vested and accrued water-rights, or rights to ditches and reservoirs used in connection with such water-rights as may have been acquired under or recognized by the preceding section.

It is to be noted that by the two sections above quoted not only were the water rights which had vested and accrued recognized, but also the rights of way for ditches and reservoirs in connection therewith.

---

[1]Secretary American Engineering Corporation and Assistant Professor Irrigation Institutions, University of California.

The first noteworthy judicial construction of the Act of 1866 was by the Supreme Court of Nevada in the case of Vansickle v. Haines (7 Nev. 249) decided in January, 1872. Both parties were the owners in fee of their respective lands. Haines' patent was dated December 28, 1864, and long prior thereto Vansickle had diverted part of the waters of Daggett Creek, which diversion was interfered with by Haines in December, 1867, under the claim of riparian ownership. The lower court rendered judgment in favor of Vansickle on the grounds of prior appropriation, but the Supreme Court held that such rights of appropriation were inferior to the riparian rights of Haines and reversed the decision. In reference to the Act of 1866, the Supreme Court said:

The Act of Congress of July, 1866, if it shows anything, shows that no diversion had previously been authorized, for if it had whence the necessity of passing the Act, which appears simply to have been adopted to protect those who at that time were diverting water from its natural channel?

Doubtless, all patents issued, or titles acquired from the United States, since July, 1866, are obtained subject to the rights existing at that time, but this is a different case, for if the appellant has any right to the water, he acquired it by the patent issued to him two years before that time, and with which, therefore, Congress could not interfere.

On May 28, 1872, the Federal Circuit Court for Nevada decided the case of Union Mill & Mining Co. v. Ferris (2 Saw. 176). The mill company, as a riparian owner, brought the action to enjoin Ferris and other farmers in the Upper Carson Valley from diverting the waters of Carson River. Regarding the Act of 1866 the court said:

For seventeen years prior to 1866, the mineral land of California and Nevada had been occupied by the citizens of the United States, without objection on the part of the government. Canals and ditches were dug at this time, often at great expense, over the public lands, and the water of the streams diverted by these means for mining and other purposes. Local customs grew up in the mining districts, by common consent, and by rules adopted at miners' meetings for governing the location, recording and working of mining claims in the particular mining district. Possessory rights to public lands, mining claims and water were regulated by State statutes, and enforced by the State courts. * * *

But the Act is prospective in its operation, and cannot be construed so as to divert a part of an estate granted before its passage. If it be admitted that Congress has the power to divest a vested right by giving a statute a retrospective operation, that interpretation will never be adopted without absolute necessity.

To appreciate the seriousness of the two Nevada decisions above mentioned, it must be remembered that the construction therein given, one who received patent prior to July, 1866, for riparian land could enjoin diversions above him to non-riparian lands no matter how long such diversions had existed; and also that any one who secured patent prior to July, 1866, to land crossed by a ditch became the owner of such ditch, or at least could stop its operation.

Fortunately for the early investors the Supreme Court of the Unnited States did not adopt the Nevada Court's view, as is clearly shown in the case of Broder v. Natoma Water & Mining Company (101 U. S. 274) decided October, 1879. The water company had constructed a ditch at an expense of about $200,000 in 1853 on lands then public. Part of the land crossed was within the Central Pacific Railroad grant under the Act of 1864 and Broder became the owner thereof and brought the action to have the canal declared a nuisance and to recover $12,000 damages on account of its maintenance on the land. In construing the provisions of the Act of 1866 in its bearing upon the case, the Court said:

In reference to his lands held under conveyance from the railroad company, it might be a question of some difficulty whether the right was so far vested in that company before the passage of this Act of 1866, that the latter would be ineffectual as regards these lands. But we not think that the defendant is under the necessity of relying on that statute.

It is the established doctrine of this court that rights of miners, who had taken possession of mines and worked and developed them, and the rights of persons who had constructed canals and ditches to be used in making operations and for purposes of agricultural irrigation, in the region where such artificial use of the water was an absolute necessity, are rights which the government had, by its conduct, recognized and encouraged and was bound to protect, before the passage of the Act of 1866. We are of opinion that the section of the Act which we have quoted was rather a voluntary *recognition of a pre-existing right of possession*, constituting a valid claim to its continued use, than the establishment of a new one. This subject has so recently received our attention, and the grounds on which this construction rests are so well set forth in the following cases, that they will be relied on without further argument.

The Broder v. Natoma Water Company decision has continued to be the accepted construction of the Act of 1866, and what uncertainty may have arisen from the Nevada decisions was thus removed.

As the first appropriations on the public domain were by the miners, it became the custom to initiate water rights by posting notices similar to those used for the mineral claims. The fact that the notice in the case of the water claim could hardly be seen except by accident and was therefore not like the mining notice which could be seen by all prospectors passing the mineral claim, did not appeal to the early miners and has failed to impress our California legislators early or late. The water claims posted in accordance with custom were recorded in the county records long prior to any legislation authorizing or requiring such recordation.

Reference has been made to Irwin v. Phillips and the rule of prior appropriation. In the following year, 1856, the case of Conger v. Weaver (6 Cal. 548) was decided and established, as between claimants on government land, the doctrine of relation in regard to appropriations in the following words:

But, from the nature of these works, it is evident that it requires time to complete them, and from their extent, in some instances, it would require much time; and the question now arises, at what point of time does the right commence, so as to protect the undertaker from the subsequent settlements or enterprises of other persons. If it does not commence until the canal is completed, then the license is valueless, for after nearly the whole work has been done, any one, actuated by malice or self-interest, may prevent its accomplishment; any small squatter settlement might effectively destroy it.

But I apprehend that, in granting the license which we have presumed for the purpose before us, the State did not intend that it should be turned into so vain a thing, but designed that it should be effectual for the object in view; and it conse-

quently follows that the same rule must be applied here to protect this right as in any other.

So, in the case of constructing canals, under the license from the State, the survey of the ground, planting stakes along the line, and actually commencing and diligently pursuing the work, is as much possession as the nature of the subject will admit, and forms a series of acts of ownership which must be conclusive of the right.

In an earlier case, Eddy v. Simpson (3 Cal. 252) decided in 1853, it was said:

It is laid down by our law writers, that the right of property in water is usufructuary, and consists not so much of the fluid itself as the advantage of its use. * * * The right is not in the *corpus* of the water, and only continues with its possession.

The general principles of prior appropriation were thus established by the California Supreme Court in the fifties. As new cases arose they were enlarged upon and strengthened, so that when the legislature did finally act upon this subject in 1872 the sections adopted were but declaratory of the existing law. The sections then enacted are 1410 to 1422 of the Civil Code and still remain, with slight amendments, the only statutory provisions on appropriation of water, with the exception of special legislation regarding appropriations for power purposes adopted at the special session of 1911.

Section 1415, providing for notices of appropriation, and Section 1416, providing for prosecution of the work, are as follows:

SECTION 1415. *Notice of Appropriation.* A person desiring to appropriate water must post a notice, in writing, in a conspicuous place at the point of intended diversion, stating therein:

1. That he claims the water there flowing to the extent of (giving the number) inches measured under a four-inch pressure;

2. The purposes for which he claims it, and the place of intended use;

3. The means by which he intends to divert it, and the size of the flume, ditch, pipe, or aqueduct in which he intends to divert it.

A copy of the notice must, within ten days after it is posted, be recorded in the office of the recorder of the county in which it is posted.

After filing such copy for record, the place of intended diversion or the place of intended use or the means by which it is intended to divert the water, may be changed by the person posting said notice or his assigns, if others are not injured by such change. This provision applies to notices already filed as well as to notices hereafter filed.

SECTION 1416. Within sixty days after the notice is posted, the claimant must commence the excavation or construction of the works in which he intends to divert the water, or the survey, road or trail building, necessarily incident thereto, and must prosecute the work diligently and uninterruptedly to completion, unless temporarily interrupted by snows or rain; provided, that if the erection of a dam has been recommended by the California Debris Commission at or near the place where it is intended to divert the water, the claimant shall have sixty days after the completion of such dam in which to commence the excavation or construction of the works in which he intends to divert the water; provided, that whenever any city and county, * * * (A proviso added in 1911 to relieve cities and towns from the necessity of prosecuting the construction work with the diligence required of other appropriators.)

Section 1418 provides that the water right will relate back to the time of posting notice on compliance with above rules.

Section 1422 provides that when the "place of intended diversion or any part of the route" is within a national park, forest reserve or other reservation, the claimant shall have sixty days from the date of approval of his application to occupy such national park, etc., within which to commence work as provided in Section 1416.

As stated above, under the doctrine of relation laid down in Conger v. Weaver, the right to appropriate water, after the completion of the diversion works with reasonable diligence, dated back to the first steps taken in regard thereto. The Statute, in Sec. 1418, fixes this first step as the posting of the notice (Sec. 1415). It is now well settled (Wells v. Mantes, 99 Cal. 583) that the Statute need not be followed in order to make a valid appropriation in California (except for power purposes under the 1911 Statute which is not under consideration in the present article), but by failure to follow the Statute the benefit of the doctrine of relation is lost and the right dates back only to the completion of the work. There is therefore nothing to be gained and much to be lost by not following the Statute.

As is shown by Sections 1415 and 1416 there is no public officer in California concerned in the form of contents of the notice of appropriation and the consequent construction work. Our county records abound in notices under which no construction or survey work was ever done. Such notices are not worthy of the slightest consideration and are in no way "clouds upon the title," as is often claimed. Unless the construction work is begun and continued with reasonable diligence to completion, as provided in the Statute no right accrues. The use of the water alone fixes the right.

In regard to the statements required by the three subdivisions of Sec. 1415, practically any notice, regardless of form, giving the number of inches claimed, the purposes, place of use, means of diversion and size of conduit, will suffice. In the records are found examples of empty generalities as well as some of refined details. As an illustration of how little need be stated, to be accepted as sufficient by the Supreme Court, the following notice from the case of De Wolfskill v. Smith (5 Cal. App. 175) is quoted.

Notice of Appropriation of Water. Take notice that the undersigned claims fifteen hundred inches of water measured under a four-inch pressure flowing from and at the wells bored by the San Jacinto Oil Company on the land which would be the northwest quarter of section four, township three south, range two west, San Bernardino meridian, if said land were surveyed by the United States, and I intend to divert said water at the three several points where this notice is posted, to wit, at each of said wells bored by the San Jacinto Oil Company.

I intend to use said water for domestic and irrigation purposes on the land which was known as the Rancho San Jacinto Nuevo and the Morena, Lakeview and Alesandro Colonies and adjoining lands in the county of Riverside, State of California.

I intend to divert said water by means of ditches of sufficient capacity to carry same, leading from each of said points.

Dated the thirteenth day of October, 1902.

ELENA P. DE WOLFSKILL.

Witness: DAVID G. DE WOLFSKILL.

ARGUMENT FOR FAIR RATE MAKING.

BY A. F. HOCKENBEAMER.

The basis of all borrowing is credit. Credit in our industry depends upon earnings and earnings are absolutely determined by the rates we are allowed to charge for gas and electricity. This inevitably leads to the deduction that public service corporations must be allowed rates that will permit them to earn, not merely a bare interest return upon their investment, but a sufficient return to establish the credit they must have in order to attract the capital necessary to the continuance of their business. That this is the conclusion reached by the Railroad Securities Commission appointed under the authority of Section 16 of the Act to create the United States Commerce Court, approved June 18th, 1910, is very clear from the report made by this Commission to President Taft under date of November 1st, 1911. This commission answers the question "What Constitutes a Reasonable Return" in the following words:

"We hear much about a reasonable return on capital. A reasonable return is one which under honest accounting and responsible management will attract the amount of investors' money needed for the development of our railroad facilities. More than this is an unnecessary public burden. Less than this means a check to railroad construction and to the development of traffic. Where the investment is secure, a reasonable return is a rate which approximates the rate of interest which prevails in other lines of industry. Where the future is uncertain the investor demands, and is justified in demanding, a chance of added profit to compensate for his risk. We cannot secure the immense amount of capital needed unless we make profits and risks commensurate. If rates are going to be reduced whenever dividends exceed current rates if interest, investors will seek other fields where the hazard is less or the opportunity greater. In no event can we expect railroads to be developed merely to pay their owners such a return as they could have obtained by the purchase of investment securities which do not involve the hazards of construction or the risks of operation."

The Chairman of the Railroad Securities Commission, Mr. Arthur T. Hadley, is the President of Yale University and one of the leading political economists of the United States. The other members, Frederick N. Judson, Frederick Strauss, Walter L. Fisher and B. H. Meyer are all men of national prominence and recognized ability, and their conclusions are worthy of the utmost confidence.

What does it cost the Pacific Gas & Electric Company to raise new capital? As already stated, it is necessary to its very existence to raise from five to ten million dollars every year. Although this money is expended in California, it cannot be raised locally and the company, when it wants to enlarge its plants. is required to knock at the same doors as the City of San Francisco when it wants to sell bonds for municipal improvements. In doing so, the securities offered for sale must compete in their quality and in their appeal to the investor with securities of thousands of other corporations. Money cannot, as with governments and municipalities, be legislated into its treasury. Its securities must conform to the standards established in the investment world or they will not command the confidence of investors, who will invest their money in the many other securities that are being offered that do conform to these standards and that do inspire their confidence. Fortunately, the Pacific Gas & Electric Company has, during the past four years, been able to obtain the confidence of investors in an increasing degree. One extensive piece of financing was undertaken in the latter part of 1907. That money, which was expended for new construction, additions, betterments and improvements is today costing this company about 11 per cent. It could not at that time be obtained at lower cost owing to the severe business depression and the impairment of our credit because of the severe losses sustained in the San Francisco fire of April, 1906. This illustrates one of the vicissitudes of our business. This high-priced money is still in our plants. To deny it a return now would be confiscation.

Within the last few months we have reorganized our financial system in such a way that we are at this time able to obtain the funds for meeting the growth of our business, not only at a materially lower rate, but upon as favorable terms as any other large public service corporation similarly situated and engaged in the same lines of business and, as a matter of fact we have within recent months, effected the sale of a large block of our bonds upon the terms which are generally regarded as extremely favorable to the company. These bonds were issued under our general and refunding mortgage. This mortgage was placed upon our entire property on December 1st, 1911. It is so designed that the company may from time to time, as it needs money for new construction, or for the payment of maturing bonds of underlying issues, sell bonds secured by this mortgage until the total of the bonds so issued aggregates $150,000,000. In fixing this limit the board of directors anticipated the needs of the company for possibly fifteen years. This mortgage, before it was finally executed by the company, was submitted to the scrutiny of three of the leading investment banking houses in the United States, and the provisions it contains are only such as, in the opinion of these banking houses, would enable the company to sell its bonds. Using as a basis our recent sale of bonds issued under this mortgage, this company, in order to finance itself with these bonds, must absolutely be allowed to earn upon its investments as follows:

(a) Actual interest rate upon the money.....	c.10%
(b) Under the terms of the mortgage no bonds may be issued unless the Company earns at least one and one-half times the interest on the new bonds as well as upon all underlying bonds, which necessitates our earning from our investment 50% of the 5% face rate of the bonds, or.....	2.50%
Total rate which we must earn upon our investment in order to finance ourselves through the sale of these bonds	8.60%
There are collateral requirements in the mortgage which must be met out of earnings, or which must be financed through the sale of junior securities at an even greater cost than above, namely:	
(c) For every bond we have outstanding we must set aside a fund of 1% per annum as a sinking fund for the retirement of our funded debt. This imposes a burden upon us at this time in excess of $700,000 per year, and, as a practical matter, may be assumed to add to the percentage of earnings above shown an additional	1.00%
(d) Under the terms of the mortgage for every $1,000 expended for new construction, we are allowed to issue bonds only to the amount of $900. The difference of $100 must be met either out of earnings or through the sale of some junior security. Based upon our estimated construction for the next five years, this will impose an additional burden upon us of $500,000 per year, or, as a practical matter, an addition to the above percentage of required earnings of approximately.....	.70%
Total	10.30%

In view of the foregoing facts and based upon many years experience in corporate financing, it is my opinion that unless this company can earn at least ten per cent upon its investment, over and above operating expenses and a reasonable allowance for depreciation, it will be unable to find the necessary capital to carry on the enterprise.

THE MERIT AND DEMERIT SYSTEM.

One large hydroelectric corporation operating in central California has specially ordered that all suggestions coming up through the separate departments bear the signature of the individual in whose brain the idea originated in order that proper credit may be given.

Now comes the Pacific Electric Railway Company that operates the great interurban electric system out of Los Angeles. In order to create an esprit d'corps among its workers and especially encourage faithfulness and ambition among all their trainmen, yardmen and towermen, a merit and demerit system has just been introduced by this corporation. In the following will be found the important details:

The practice of administering discipline by actual suspension is discontinued and substituted by a system of record suspension, under which the employe is allowed to continue at work, and demerit marks, corresponding in number as far as practicable to the number of days employes are kept off duty is noted against each employe's record in the office of the superintendent. The accumulation of seventy-five demerits result automatically in discharge from the service. When fifty demerits have accrued, the employe is called to the office and shown the lines along which he must improve if he expects to be retained. No suspension is recorded wthout notice to the person affected and an opportunity given for explanation. Any employe may have access to his own record at any time. If a discharged employe feels there are extenuating circumstances, he may appeal personally to the superintendent, and if his re-instatement is approved by proper authority, the debit against his record will commence at fifty demerits. The second accumulation of seventy-five demerits will permanently retire the employe.

Credit will be allowed for meritorious service, commendable acts, deeds of heroism and loyalty, good judgment in emergencies, etc., by a like method of merit marks, the number of which will cancel a corresponding number of demerits. If at the time the employe's record is clear, the credit will apply against a future debit.

Record bulletins will be issued by the superintendent monthly, showing for educational purposes a brief account of each case resulting in discipline, and stating when necessary how it could have been avoided, but giving no names ,or information identifying the person at fault.

This system is inaugurated with a view to furthering the welfare of the employe in that it will not work financial hardship upon him, and to securing a higher state of efficiency in that it will act as an incentive to meritorious service, which it has not been practicable heretofore to recognize in a substantial way.

Below is given a list of acts of omission or commission for summary discharge and for demerits and merits. This is subject to modification as conditions may require from time to time.

Dischargeable Offences.

Gross carelessness or disobedience of orders resulting in accident.
Dishonesty or false statements.
Insubordination or disloyalty.
Fighting on duty.
Intoxication or frequenting saloons.
Sleeping on duty.
Incompetency or unsatisfactory service.
Failure to flag railroad crossings.
Unsatisfactory references.

Merits.

Clear service record six months	15
Clear service record one year	30
Detecting bogus transportation	10
Meritorious service in avoiding accident, or unusual assistance or good judgment in emergencies, or any commendable act out of the strict line of duty	5 to 30

Demerits.

Missing run or late—	
First time	Reprimand
Second time	5
Third time	10
Discourtesy	10 to 30
Altercation with passengers	5
Smoking on duty, passenger cars	10
Reading on duty	5
Inattention to duty or unnecessary conversation	5
Careless operation: (See foot note.)	
Resulting in accidents narrowly averted	5 to 15
Resulting in minor accidents	20 to 30
Failure to observe train order or check register, or observe schedule of superior trains, or running railroad crossing, not resulting in accident	30
Passing fixed danger signals not resulting in accident	30
Failure to report accidents, defects, etc.	10
Talking to outsiders about accidents or criticizing management or policy of the company	10
Lack of neatness	5 to 10
Careless handling and registration of fares and tickets	5 to 20
Signals imperfectly given and respected	5 to 15
Signals imperfectly displayed	10
Violating speed restrictions	5 to 20
Running ahead of schedule	5 to 20
Making poor reports:	
First time	Reprimand
Second time	5
Rough handling of freight or equipment	5 to 10

Foot Note.—"Careless Operation" includes among other things:
Careless flagging.
Splitting switch.
Allowing air to leak.
Leaving car unprotected.
Moving trains on improper signals or without signals.
Running derails.
Leaving switch open.
Flattening wheel unnecessarily.

A GAS PRODUCER CREMATORY.

The following letter is one of the best bits of imaginative humor that has been written along mechanical lines, being a copy of a letter read at a district agents' meeting of the Southern California Edison Company of Los Angeles, by H. N. Sessions, commercial engineer, to whom we are indebted:

Dear Sir:—I herewith disclose an inspiration that has come to me, and I wish your assistance in putting my plans into practice. I have conceived the idea of building what in a few words might be termed a gas producer crematory. Its purpose is to conserve not only the ashes of the body, but every other constituent as well, such as gas gastric juice, etc., and all poisons that may be present.

My first conception is contained in the book of James, paragraph 4, verse 14: "For what is your life? It is even a

vapor that appeareth for a little time and then vanishes away." I believe this vanishing vapor mentioned in the scripture is gas.

Gas is a late word, a contraction of Geist, meaning ghost or spirit in German. This information has aroused the strong instinct I have always had of gas and its relationship to the human being. We all must dread being interred, I do, and the present system of cremation is almost as unsatisfactory when we consider that only the ashes which represent a small part of us is all that is accounted for.

It requires 900,000 British thermal units to convert the average person; this heat varying somewhat for a hardened criminal or a Good Government worker, as the case may be, but I can guarantee that with my process their departure from this world will in contrast make their future existence, wherever it may be, seem cool and delightful.

My idea is to install a bench gas generator where the body can be smelted. It only requires 1,500 cubic feet of gas to bring the retort up to heat and cremate one body which at a dollar per thousand, is only $1.50, but with my plan, however, gas will cost nothing, as I will presently demonstrate.

The eminent Dr. Sulphume of Massachusetts in his "Gas Treatise" fixes the volume of gas contained in the average body at approximately 4000 cu. ft., the calorific value of which is 600 of John Bull's standard in each foot. His tests were conducted on a number of Boston beings, and he has allowed a liberal margin for leakage, etc. The candle power of the gas is high or low, it goes up or down, depending on the age and sex of the fuel.

Now then, if Dr. Sulphume is correct, each body will furnish 4,000 cu. ft; 1,500 cu. ft. of this can be used for the regeneration of the next departing soul, and the balance or 2,500 cu. ft. can be conserved and disposed of in many useful and novel ways. If the relatives or heirs of the departed do not wish his gas after he has been scrubbed and purified, he can be blown into the storage tanks to float freely among a peaceful crowd of gasified strangers, without having his pockets picked. On the other hand he can be squeezed like presto-lyte under a high pressure, and delivered to his sorrowful widow, for example in a miniature bronze statuary receptacle, along with his powder. His gas can escape and burn like half a candle at a small pet cock, furnishing a wee flicker of light hope to his dear ones—or his gas with his ashes can be tossed to the winds; his ashes to fall to earth, but his vapor to ascend up, only to hang in a stratum with other comrades of equal weight or specific gravity.

The profit of such an undertaking is dead sure. Fuel will cost nothing, as the gas derived from one body (4,000 feet) is more than ample to cremate the next. The entire operating expense will be offset by the by-products alone; the gold and silver dental work will smelt into a button ranging from $3.00 to $10.00 bullion value.

I wish to organize the parent company at Oakland, to be called the Oakland Gas Undertaking Company, with capital stock of $200,000, composed of 20,000 shares at $10.00 par value each.

The stock will all be sold at par value, and shall be nontransferable, non-assessable and non-redeemable. No stockholders shall be allowed to possess more than one share, which will net him dividends of 25 per cent on a conservative basis, and entitle him to free cremation at death, when the earning power of his certificate shall cease, as it must be burned with him. These stock certificates will be similar to the Consols of England, and will give consolation at least—at last of a decent finish. The full 20,000 shares must be taken up by as many people of Oakland; this will raise $200,000, which is sufficient to make an erection of the plant and purchase patent rights. I estimate that in fifty years all, or nearly all, of the stockholders and stock shall be gone, which means that the outstanding stock will diminish each year to the extent of $20,000 and the dividends on the remaining stock will necessarily increase proportionately, so that the individuals who part last with their lives and stock will reap the greatest benefit; hence this will be an opportunity for the most youthful to take advantage immediately. When the stock and holders of stock shall have become extinct, the institution might be dedicated to Oakland.

Yours truly, PEAT SHALE.

Cow Hollow, Alameda, Co., Cal.

ELECTRIC RAILWAY ACCIDENT PREVENTION AT SEATTLE.

For the purpose of discussing ways and means of educating the public and the employes of the Seattle Electric Company in the prevention of accidents on street cars, the safety committee of the Seattle Electric Company gave a complimentary banquet at the Butler hotel last week. Plans were discussed to organize the local car barns for the prevention of accidents.

George Carson, general claim agent, was the chairman of the evening and officiated as toastmaster. The following spoke on subjects relative to means of averting street car accidents: A. J. Falkner, "The Legal Side of the Accident Question"; H. S. Elliott, "Relations of Public Service Corporations to the Public"; A. L. Kempster, "How the Safety Committee Can Prevent Accidents"; Dr. Park Weed Willis, "Relations Between the Claim Department and the Medical Department"; W. J. Grambs, "The Lighting Department," and H. T. Edgar on "Co-operation."

WESTERN CODE OF ENGINEERING ETHICS.

The Pacific Association of Consulting Engineers was recently organized with headquarters in San Francisco. It embraces in its charter membership the following engineers, engaged in consulting practice:

A. L. Adams, F. G. Baum, Bernard Bienenfield, W. A. Cattell, C. Derleth, Jr., G. L. Dillman, J. H. Dockweiler, Edwin Duryea Jr., J. D. Galloway, C. E. Grunsky, Wm. Ham Hall, P. E. Harroum, Col. W. E. Heuer, L. J. Hohl, Howard C. Holmes, A. M. Hunt, N. B. Kellogg, C. D. Marx, M. M. O'Shaughnessy, Luther Wagoner, J. H. Wallace, C. B. Wing.

The association is actively urging a decided change in the present system of procuring expert witnesses in the courts. In regard to this phase of its ethics the association has put itself on record as pledged to the following provisions:

2. For the purpose of improving present court procedure in its relation to engineering practice, and for the purpose of increasing the efficiency of the engineering profession as an aid to the settlement of questions in controversy, this association believes it desirable to restrict such engagement as soon as practicable to the following conditions:

a. As a witness when appointed by and compensated through the agency of the court.

b. As court commissioner, referee or other examiner, preferably sitting with an attorney, to take evidence involving engineering questions.

c. As arbitrator appointed by either party to the controversy, or by both parties jointly through the agency of the court or otherwise, and compensated by both parties conjointly.

d. As special adviser to either contestant.

JOURNAL OF ELECTRICITY
POWER AND GAS

PUBLISHED WEEKLY BY THE
Technical Publishing Company
Rialto Building, San Francisco

E. B. STRONG, President and General Manager
A. H. HALLORAN, V. P. and Managing Editor
ROBERT SIBLEY, Treasurer and Editor in Chief
C. L. CORY, Secretary and Special Contributor
A. M. HUNT, Director and Special Contributor

On Library Cars of all Southern Pacific Trains.

TERMS OF SUBSCRIPTION

United States, Cuba and Mexico	per year.	$2.50
Dominion of Canada	"	3.50
Other Foreign Countries within the Postal Union	"	5.00
Single Copies, Current Month	each	.25

NOTICE TO ADVERTISERS

Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

Entered as second-class matter at the San Francisco Post Office as "The Electrical Journal," July 1895.
Entry changed to "The Journal of Electricity," September, 1895.
Entry changed to "The Journal of Electricity, Power and Gas," August 15, 1899.
Entry changed May 1, 1906, to "The Journal of Electricity, Power and Gas." Weekly.

FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

CONTENTS

A Modern Municipal Water Works 283
Thermometer Corrections 285
Maximum Demand Rate Schedule at Portland 285
Development of the Turbine 286
By Geo. J. Henry Jr.
British Columbia Telephone Rates 291
Early Development of the Doctrine of Appropriation 292
By A. E. Chandler.
Argument for Fair Rate Making 295
By A. F. Hockenbeamer.
The Merit and Demerit System 296
A Gas Producer Crematory 296
Electric Railway Accident Prevention at Seattle 297
Western Code of Engineering Ethics 297
Editorial 298
Western Water Rights.
The Basis of Western Rate Fixing.
A Western Code of Ethics.
Personals 300
Trade Notes 300
Portland Institute Meeting 301
Electrical Contractors' Notes 301
Industrial 302
A New Oil Switch for Industrial Applications.
News Notes 303

Western Water Rights

There is no more potent inflence in the West for her substantial upbuilding than that of carefully and properly devised laws governing water rights in the various commonwealths of our western empire. Long since the real estate man in full realization of the inherent blessings of water, sang his pretty song:

"Little drops of water
Added to the sand
Make a heap-a-difference
In the price of land."

But not alone are those directly interested in real estate dependent upon the profitable development and equitable distribution of water. Our mines, our great natural water powers—in fact our very life depends upon the security with which water rights are to be obtained. To obtain security, a careful study of existing laws and court decisions must be made. One should master the doctrine of appropriation as opposed to the riparian doctrine, existing in the older Eastern States. The storage of flood waters and even the intricate decisions of the courts concerning the recovery of percolating waters must be carefully gone into. California, Wyoming, Colorado, Idaho and the other arid States of the West have enacted laws covering the abandonment and forfeiture of water rights. Rights of way over the public domain and questions involving the delicate considerations when interstate streams are to made use of become at times most important. A knowledge of the principles involved in the organization of canal companies and the fixing of water rates is of vital interest to Western men.

The Journal is fortunate in being able to announce to its readers that a series of papers written by A. E. Chandler, will appear in our columns from time to time covering the complete discussion of water rights and their interpretation.

Mr. Chandler has been connected with the U. S. Geological Survey and with the Reclamation Service, Moreover as first State engineer of Nevada, he put into definite form ideas of water control and equitable distribution. By this he showed himself qualified for the duties incumbent upon an engineer in full charge of land and legal matters in the field for the Reclamation Service, the position that he held from 1905 to 1910. These five years spent in passing on water claims throughout the West have given Mr. Chandler a breadth of knowledge and experience in these matters possessed by few other engineers. Mr. Chandler now occupies a position in engineering activity associated with the well known expert, C. E. Gunsky of San Francisco, and at the same time he is associated with the great work in irrigation institutions at the University of California. His writing bears the culture and stamp of the college man and student. It is then with a genuine pleasure that we publish the beginning of this series elsewhere in this issue of the Journal.

The Basis of Western Rate-Fixing

The modern long distance electric power line supported by miles of vertical uprights with their horizontal arms, capped with the beautiful corona effect, which at times appears in modern high tension transmission, appeals to the power plant owner and the consumer alike—not as a series of golden crosses with their crowns of thorns, but rather as miles of burden-bearers threading their way from the high Sierras, Cascades and Rockies into the centers of industry and human activity. These miles of upright supports, transmitting for man's good the subtle forces of the captive water-fall, may almost be imagined to glory within themselves over the joy and the comfort they are about to bring to human society. In the beautiful corona issuing from their fiery tips we almost see a god-given soul rejoicing in this inner realization.

The poetry of hydroelectric development in the West is not, however, to be written in words. A higher, truer poetry—a poetry entuned with the infinite—is to be found in the contemplation of the rise of our western empire and the far-reaching effect the development of our water powers has had in this great work.

Now comes the commission empowered by law to look into the affairs of the great hydroelectric companies. The duties devolving upon the membership of a commission are the highest and yet at the same time the most delicate imaginable. Throughout the West the sound of the builder's hammer is heard on all sides. Capital by the millions is needed each year and we must seek the great money markets of the world for necessary funds, Of necessity, then, we must operate and control our public service corporations in such a fair-minded manner as to ensure our western financial credit remaining equal to the best.

In California the great corporations are laying before the commission their financial minimums in earning capacity—minimums below which credit will be impaired. The argument of the Pacific Gas & Electric Company, found on another page in this issue, is worthy of careful scrutiny. An earning of ten per cent upon its physical valuation investment, over and above operating expenses and a reasonable allowance for depreciation, is asked.

The recent public service commission law of California expresses in no uncertain terms that economies, efficiencies and improvements on the part of the great public service corporations should be encouraged by the commission in every reasonable manner. The gigantic development ahead for the next ten years, to accomplish which every avenue of credit must be kept intact and encourgaed, demands that the various municipal commissions and State commissions weigh with utmost delicacy any proposal to so curtail earnings as to jeopardize the development of western enterprise. Indeed, a lesson is to be learned from Eastern decisions. The New York Commission has put itself on record as not only bound by sentiment but the dictates of justice lead it to express itself in the following emphatic terms:

"Various standards have been suggested for determining the fair rate of return. The one, which in our opinion, is properly applicable to this case is that the rate should be such that investors would be induced to provide funds with which to construct and extend a gas and an electric plant within the area in question. If the State were to fix a rate below this standard, capital could not be secured. If investment were made before the State acted, the original capital might be forced to remain, but additiinal capital could not be secured unless necessary to protect the first outlay."

Let us, then, oil up the slide-rule and find where the credit-keeping minimum is located.

A Western Code of Ethics

The modern consulting engineer in his ethical evolution, like the rotating magnetic field, is ever attempting to catch up with the impelling influences of modern thought and progress. Indeed, the recent action of the Pacific Association of Consulting Engineers, not only entitles that group of experts to be considered as catching up with modern trend of ideas but it may be characterized as leading the march of ethical affairs by a safe and conservative angle of advance.

Of course the true engineer will not allow his opinion to be biased, no matter who may be paying the fee, yet to testify under such conditions certainly puts the consulting engineer in the light of a partisan. Solely for the purpose of aiding in establishing the truth, he is placed on the stand. No sinister motive should ever make him swerve from his high position. nor should he be put to the humiliation of having any one say his opinion was in any measure influenced by the size of the fee to be received or suffer the insinuating glance of the opposing faction which often plainly shows they believe the professional opinion is influenced by the quarter from which the fee is to come.

How much more in keeping with the highest ends to be accomplished would it be for the court to appoint the consulting engineering witness and have him compensated through the agency of the court. As a court commissioner, referee or other examiner preferably sitting with an attorney to take evidence involving delicate engineering questions, the professional consulting engineer would then be entitled to the dignity such a position should command and to the weight such unbiased technical evidence should add to the deliberations and decisions of the court. It is of course within thorough ethical ideals to appear as a special adviser to either contestant, but when evidence is desired upon which to decide the merits of the case, the consulting engineer, eminently qualified for the difficult and delicate questions at issue, would meet his highest field of usefulness by sitting as an arbitrator appointed by both parties jointly through the agency of the court or otherwise, and compensated jointly by both parties to the issue. Such are the high ethical ideals of the Pacific Association of Consulting Engineers and to these ideals may they strictly adhere, and may they receive the whole-hearted support from the legal fraternity, which they fully deserve.

PERSONALS.

Jacob Furth, president of the Seattle Electric Company, was at San Francisco this week.

John A. Crombach, an electrical supply dealer of Sacramento, was a recent San Francisco visitor.

W. J. Wallace, right-of-way agent for the Southern California Edison Company is a recent San Francisco visitor.

H. B. Kinney has been appointed superintendent of the northern division of the Great Western Power Company, with headquarters at Santa Rosa, Cal.

J. W. Whistler, hydraulic engineer, has been engaged by the City Council of Pendleton, Ore., to investigate the proposed municipal electric power plant.

E. V. D. Johnson, manager of the Northern California Power Company, is making an inspection of the various hydroelectric plants and transmission lines of the system.

George L. Hoxie, consulting electrical engineer at New York City, has arranged to open a branch office at Los Angeles and has associated with him Meade Goodloe.

G. R. Murphy, manager of the electric storage battery department of Pierson, Roeding & Company, has returned to the San Francisco office after a business trip to Seattle.

D. G. Young, recently joined the electrical sales department of the Allis-Chalmers Company's San Francisco office, after spending some time in the Seattle and Portland offices.

H. C. Goldrick, manager of the Pacific Coast department of the Kellogg Switchboard & Supply Company, of Chicago, has returned to his San Francisco office after visiting Fresno on business.

F. P. Rawson has returned to Seattle after locating a transmission line for the Northwestern Electric Company, to supply power to the Crown Columbia Paper Mills, Camas, Washington.

H. F. Gronen, engineer in charge of construction work at Tacoma's hydroelectric plant, at Nisqually, has been elected commissioner of light and power to fill out the term of Ben J. Weeks, resigned.

E. G. Lorbeer, of the Lorbeer Electric Supply Company of Los Angeles, spent the past week at San Francisco visiting his branch wholesale supply house at 633 Howard street, which is being managed by E. G. Alexander.

L. E. Alspaugh, an engineer who has been with the San Francisco office of J. G. White & Co. for the past four months, will report to the firm's New York office April 1st, to take a permanent position in the hydraulic department.

R. P. Perkins, who has been with the Y. M. C. A. as first assistant engineer for the past year has been appointed traveling engineer in the eighteenth lighthouse district with headquarters at the new Customs House, San Francisco.

Charles Blizard, third vice-president of the Electric Storage Battery Company of Philadelphia, and J. L. Woodbridge, the chief engineer of the same corporation, arrived at San Francisco on a tour of the Pacific Coast during the past week.

Garnett Young, manager of the Telephone-Electric Equipment Company, left last Wednesday for a month's Eastern trip in the cause of which he will visit a number of factories. He will attend the annual sales meeting of the National Metal Molding Company at Pittsburg, April 2d, 3d and 4th.

F. B. Gleason, manager of the Western Electric Company's Pacific Coast department, has returned to his San Francisco office after visiting the Portland and Seattle branches.

A. W. Bullard, vice-president and general manager of the Great Western Power Company, made an inspection of the dam-site at Big Meadows, with H. H. Sinclair and F. W. Rollins of Boston, during the past week. Work on the great dam will be prosecuted vigorously during the coming season.

A. C. Sprout and Sidney Sprout, engineers for the California-Oregon Power Company, recently returned to San Francisco from Siskiyou county, where work is soon to be rushed on the new Klamath River development in order to take care of the growing business. Each generating unit will be driven by an 18,600-h.p. water wheel. Bids have been received for one of these units for early delivery and it is understood that two more are to be ordered for installation within a year.

Glenn C. Webster, manager of the engineering department of the National Electric Lamp Association, Cleveland, Ohio, is making a trip through the South Atlantic and Gulf States, where he will visit the principal cities of Tennessee, North and South Carolina, Georgia, Florida, Alabama, Mississippi and Louisiana in the interests of the incandescent lamp industry. A study of the incandescent lamp consumption in the United States, from data recently compiled by Mr. Webster, indicates that the South Atlantic and Gulf States are not keeping pace with other sections of the country. Statistics show that incandescent lamp sales in this section amount to about 28 lamps per 100 inhabitants, or an average of little better than one lamp for every four persons. This is in marked contrast with the one hundred and fifty lamps used per one hundred inhabitants on the Pacific Coast, or with the one lamp per capita used in those States bordering on the Great Lakes. Mr. Webster is deeply interested in the co-operative movement on foot among the men connected with all branches of the electrical industry and is recognized as a leading spirit in the progressive Electrical League of Cleveland. During a recent visit to the Pacific Coast, he participated in the launching of the Electrical Development League of San Francisco and in a similar organization among the members of the electrical fraternity of Los Angeles, Cal.

TRADE NOTES.

Henry H. Thedinga, district sales agent of the Century Electric Company, of St. Louis, recently moved his office to 343 Central building, Seattle, Wash.

The General Electric Company has sold to the Los Angeles Gas & Electric Corporation: One C. C. 4, 125 kw., 2400 r.p.m., 120 (slant) 125 v., horizontal, condensing Curtis turbine generator exciter set for use in connection with a new 5000-kw. turbine generator.

The Western Electric Company's Oakland branch, managed by E. A. Crowson, is to be removed from 507 Sixteenth street to a much better store, which has been handsomely fitted up, on the corner of Nineteenth street and Telegraph avenue. A full line of the company's goods will be carried.

The Westinghouse Electric & Manufacturing Company has sold to the Mt. Whitney Power Company two 1750-kw., 2300-volt, 60-cycle, 3-phase generators, which will be direct connected to two Pelton water wheels operating at 300 r.p.m. Also, one 55 kw. water wheel-driven exciter set and one 55-kw. motor generator set.

The second annual banquet of the employees of the Westinghouse interests was held Saturday evening, March 16, at the Fort Pitt Hotel, Pittsburg, Pa. About five hundred of the employees of the various companies located in the Pittsburg district were present, and all agreed that it was the most successful affair of this kind that had ever been held.

A notable order has been secured by the Fort Wayne Electric Works for a number of electric rock drills for use in the Pacific Light & Power Company's new tunnel in the San Gabriel Canyon. The tunnel, 7x4 feet, is being driven through black Gunnison granite, which is extremely hard. It is understood that the low maintenance was the determining factor in choosing these electric drills, after a series of severe tests in competition with air drills of various types.

PORTLAND INSTITUTE MEETING.

The two hundred and seventy-first meeting of the American Institute of Electrical Engineers will be a Pacific Coast meeting held at Portland, Oregon, April 16 to 20, 1912. This meeting will be similar in its scope to those held on the Pacific Coast in San Francisco in 1910 and Los Angeles in 1911. President Gano Dunn will attend this convention and preside over its meetings.

The convention committee consists of F. D. Weber, chairman, Portland, Oregon; H. R. Wakeman, P. Lebenbaum, L. B. Cramer, C. L. Wernicke, W. D. Scott, S. G. McMeen, W. S. Turner, O. B. Coldwell, Portland, Oregon; S. B. Charters, San Francisco, Cal.; A. A. Miller, Seattle, Wash.; F. D. Nims, Vancouver, British Columbia; O. H. Ensign, Los Angeles, California; J. B. Fisken, Spokane, Wash.

Arrangements have been made for reduced fares from all points on the Pacific Coast. These rates will be given under the "certificate plan." The fare will be one and one-third of the regular one-way fare. Members must ask for receipt certificates when purchasing tickets, if the fare exceeds 50 cents "on the going trip." These receipt certificates must be presented for the signature of the secretary of the meeting before same become valid. Complete information may be obtained at any railway ticket office.

Programme.

Tuesday, April 16, 1912.

10:00 a. m.—Registration.

11:00 a. m.—Address of welcome. S. G. McMeen, president Mount Hood Railway & Power Company.

1:30 to 5:30 p. m.—Papers and discussions.

Entertainment—During the afternoon a trip to Council Crest for the ladies has been arranged. Tuesday evening there will be held an informal banquet for members and ladies.

Wednesday, April 17, 1912.

9:30 a. m. to 12:00 noon—Papers and discussions.

1:30 to 2:30 p. m.—Papers and discussions.

Entertainment—3:00 p. m.—River trip to Oregon City, visiting plants and points of interest. Evening has been left open.

Thursday, April 18, 1912.

9:30 a. m. to 12:00 noon—Papers and discussions.

1:30 to 5:30 p. m.—Papers and discussions.

Entertainment—Auto trip around the city has been arranged for the ladies in the afternoon.

8:00 p. m.—Mr. A. H. Babcock, electrical engineer, Harriman lines, will give a talk on the "Operation of 1200-Volt System of the Southern Pacific Company." This talk will be illustrated by lantern slides.

Friday, April 19, 1912.

8:00 a. m.—All-day excursion to River Mill and Estacada plants of the Portland Railway Light & Power Company and the Bull Run development of the Mount Hood Railway & Power Company.

Lunch will be served at the Estacada Hotel. The ladies may attend this excursion if they so desire.

Friday evening left open.

Saturday, April 20, 1912.

Entertainment.—Trips to substations, steam plants, etc.

Papers.

"Operation of Two Alternating Current Stations Through Parallel Circuits and the Distribution of the Load and Wattless Current Between Them".....By J. W. Welsh

"Air Gap Flux Distribution in Direct Current Machines"... .....By Charles R. Moore.

"Principles to Be Considered in Selecting a Water Wheel Unit" .....By. O. B. Coldwell

"Irrigation in the Spokane Valley".....By L. J. Corbett

"An Underground System and a Few Developments"..... .....By S. B. Clark

"Alternating Current Systems of Underground Distribution" .....By S. J. Lisberger and C. J. Wilson

"Automatic Private Branch Exchange Development in San Francisco" .....By Gerald Deakin

"Long Distance Telephone Transmission on the Pacific Coast" .....By C. A. Turner

"The Design of Telephone Pole Lines for Conditions West of the Rocky Mountains" .....By A. H. Griswold

"The Application of Automatic Selecting Devices to Telephone Multiple Switchboards" .....By A. H. Dyson

"Plant Efficiency" .....By J. D. Ross

"Practical Joint Pole Construction".....By J. E. Macdonald

ELECTRICAL CONTRACTORS' NOTES.

L. R. Boynton of the Central Electric Company spent Tuesday in Sacramento on business.

C. V. Schneider, of the Electric Supply Company of Sacramento, was in San Francisco Saturday.

A. F. Flannigan, an electrical contractor from Stockton, was in San Francisco Monday.

Wiring bids for the Standard Oil Company's new building are to be in by March 29th.

Following is the programme of the National Electrical Contractors' Association in Denver:

July 16—Meeting of board of directors and executive committee.

July 17—First session of convention open to all that attend at 10 a. m. Governor Shaforth of Colorado will deliver an address on "The Resources of Colorado," and he will be followed by two speakers on electrical subjects. Business session, 2 p. m., for members. Ladies and non-members will be given a sightseeing trip. 8 p. m.—Reception and dance. 10 p. m.—A rejuvenation of the Sons of Jove.

July 18—Business meetings at 10 a. m. and 2 p. m. At 12:30 the Denver Electric Club will give a dinner to all attending convention. 8 p. m.—Annual dinner for everybody, followed by vaudeville show.

July 19—An all-day trip to Corina. Luncheon will be served on the train.

It is up to you to be in Denver the week of July 17th, and the Denver people will see that you don't regret going.

CORRECTION ON WIRING COSTS.

To the Editor: I have read with much interest the article in the Journal, dated March 23d, under the heading "Electrical Contractors' Notes," from the pen of J. N. Pierce of Chicago, and while the figures presented by him are very interesting, they are most certainly misleading, and it is my belief that this method of figuring jobs has to a great extent been the basis of insufficient profits on the part of the electrical contractor.

I think we will all agree that the basis for determining overhead should be sales and not costs, hence, the figures of Mr. Pierce would not give the contractor the 10 per cent profit which he shows him to have earned. The correct figures of the problem submitted should be:

Cost of job	$5000
Overhead 20 per cent on sales = 25 per cent on cost	1250
Cost of job	$6250
Profit 10 per cent	625
Proper bid	$6875

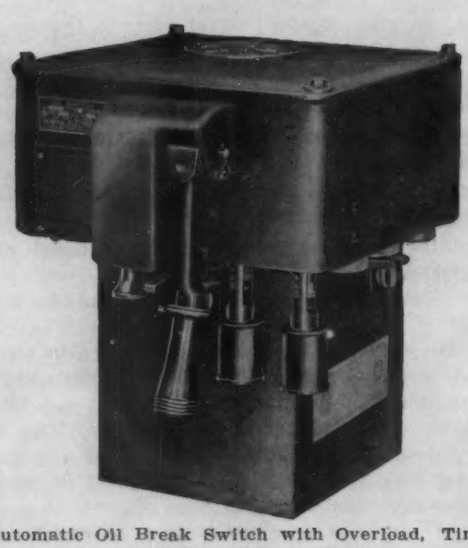
WM. L. GOODWIN.

INDUSTRIAL

A NEW OIL SWITCH FOR INDUSTRIAL APPLICATIONS.

Those who are interested in the applications of electricity in industrial plants such as powder works, coal mines, cement mills, gas works, textile mills and the like, especially where explosive gases or flying inflammable materials are present, will welcome the introduction of a new oil switch which can be satisfactorily used in such locations and under these conditions.

Before designing this switch the conditions of operation in the places enumerated above and the difficulties to be overcome were carefully canvassed with the result that the following qualities were incorporated in the design of the switch:



Automatic Oil Break Switch with Overload, Time Limit and Low Voltage Release.

First: Safety by having all live parts entirely enclosed.

Second: Reliability by constructing the switch so that it can be operated by unskilled operators.

Third: Durability by having the best of mechanical construction.

Fourth: Flexibility by a combination of features adapting it to a wide range of requirements.

This switch is manufactured double and triple pole in capacities up to 300 amperes and 2500 volts, both non-automatic and automatic. The automatic switches are tripped by overload coils connected in series with the line and can be furnished in the following combinations:

First: With overload trip coils, instantaneous or time limit with low voltage release attachment.

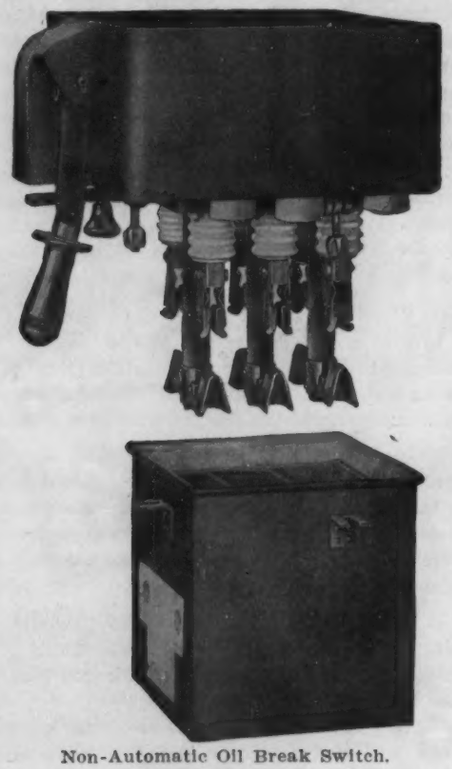
Second: With overload trip coils, instantaneous or time limit without low voltage release attachment.

Third: Low voltage release only.

The switch leads are usually brought out through the sides and bottom of the switch frame but if it is necessary to bring them out at the top, special covers can be provided. These are made in two pieces, one removable to secure access to the interior of the switch without disturbing the wiring, and the other supplied with holes for the leads. Covers can be furnished with porcelain bushings for open wiring; with holes for conduit wiring, or, with holes for bell mouths to take triple conductor cable.

These switches can also be supplied with special covers for mounting a series ammeter on top of the switch to make, in effect, a complete induction motor control outfit, thus dispensing with the usual panel and supports. These covers are also made in two parts. The front half carries a bracket for mounting the ammeter with porcelain bushings for the instrument studs, while the rear half is removable to facilitate making connections to the switch and from the switch to the ammeter. The ammeter is a useful adjunct to the oil switch as it indicates at all times the current taken by the motor and can be used to detect faults in the motor circuit, thus permitting immediate corrections of minor troubles which might otherwise cause a shut down.

Although these switches are practically dust-proof for ordinary conditions, when used in cement mills, etc., extra precautions must be taken to exclude dust, and special gas-



Non-Automatic Oil Break Switch.

kets can be furnished which will accomplish this purpose.

An interlock can also be supplied so that when the switch is used with induction motors employing resistance for starting or varying the speed the switch cannot be closed unless the resistance is in the "off" position.

In installations where a large number of induction motors are used it is some times desirable to install a locking device in connection with the oil switch so that an operator can shut down the motor to work on a machine and lock the switch. No other person can then start the motor accidently or otherwise, until the first operator, who holds the locking key, is ready and returns the key. An arrangement to accomplish this can be furnished, which consists of a magnetic lock in connection with the low voltage release and a special snap switch with removable key. Special indicating lamps are also used which are lighted when the oil switch is locked open and the key removed from the snap switch. If desired the magnetic lock can be operated from several stations, the removal of the key from any one preventing the starting of the motor until all keys are in place.

These switches are known as the type "F," Form "K-20" and are made by the General Electric Company, Schenectady, New York.

NEWS NOTES

INCORPORATIONS.

SEATTLE, WASH.—Globe Telephone Company, $1,000,000, by J. R. Wheat, G. W. Temple, et al.

SAN JOSE, CAL.—The Senorac Power Company, $500,000, by C. P. Anderson, J. F. Tatham, D. M. Burnett and A. L. Brassy.

SAN FRANCISCO, CAL.—The Standard Carbon Products Company has been incorporated by C. L. Hollis, T. A. Johnson and L. T. Mayhew.

SACRAMENTO, CAL.—The Truckee River General Electric Company is a Maine corporation, capitalized at $3,000,000, papers for which have been filed. The directors are residents of Maine.

ASTORIA, ORE.—Articles of incorporation of the Mutual Telephone Company have been filed. The incorporators are W. D. Torrey, A. J. Gragg and I. N. Fleicschner, and capital stock is $2500. They will construct a telephone line from Seaside to Elk Creek.

SACRAMENTO, CAL.—Articles of incorporation have been filed by the Sacramento Interurban Railway, which proposes to construct an electric line connecting Sacramento, Fair Oaks, Orangevale and Roseville. The capital stock is $500,000, with $50,000 subscribed. D. W. Johnston of the North Sacramento Company is the heaviest stockholder. Other directors are M. N. Williamson, Marshal Diggs, Ray C. Waring, A. D. Kidahl, Charles E. Hollister and James F. Elliott, all owners of North Sacramento lands. The proposed line will be 30 miles in length.

SACRAMENTO, CAL.—Incorporation papers for the Mt. Shasta Aqueduct Corporation, capitalized at $10,000,000 with offices at San Francisco have been filed. The purpose is to supply water to cities, develop power sites, etc. The directors named are: Clarence E. Sheets, Oakland; Thomas H. Laine, Berkeley; William L. Hawkins, Joseph P. Kennedy and H. McDonough, San Francisco. Papers also were filed for the National Power Company, capitalized at $10,000,000, with chief offices at Oakland. The directors named are: Leon M. Cave, H. L. Breed, Charles Cross, J. E. Bowers and E. A. Harriman, all of Oakland.

OAKLAND, CAL.—At the organization meeting of the San Francisco-Oakland Terminal Railways, the following officers were elected: E. A. Heron, president; first vice-president, W. R. Alberger; second vice-president, Dennis Searles; directors—E. A. Heron, W. R. Alberger, Dennis Searles, Edward D. Keiffer, W. W. Briggs, B. M. Atken and F. W. Frost; chief counsel, Harmon Bell. After the meeting, President Heron said: "The filling in of the Key Route pier for its entire length and the enlarging of the pier at the western end will be the first work undertaken. This will proceed at once. The trainshed will be enlarged, room being made for additional tracks and ferry slips." An intimation of what the men behind this consolidation expect to do in the next few years was given by the filing of a deed of trust for the terminal properties with the Mechanics' Trust Company of New Jersey preparatory to a bond issue of $30,000,000. What is to be done with this money is not explained, but it is understood that it will be one of the first large issues on which the Railroad Commission, with its enlarged powers, will have to pass The San Francisco-Oakland Terminal Railways will carry on the improvements planned by the various corporations before the merger. This includes the extension of the Key Route lines to San Jose to Richmond and up into Central California. The suburban service of the Oakland Traction Company is to be much improved, while a number of new lines are planned for the near future.

SAN FRANCISCO, CAL.—The filing of incorporation papers by two light and power companies having similar names and designed to do business in adjacent territory has given rise to rumors of a merger of interests. The Coast Counties Company is incorporated with a capital of $4,000,000, divided into 40,000 shares of a par value of $100, half being preferred and half common stock. The incorporators are: Henry Mallock, Oakland; William R. Bosley, Geo. H. Susman, S. W. Pryer, S. oVlmer and K. L. Dazey, San Francisco and J. E. Daub of Oakland. The Coast Valleys Company is incorporated for $5,000,000. The shares have a par value of $100 and are divided as follows: 20,000 preferred and 30,000 common. The incorporators are: H. A. Thornton, Berkeley; John F. Forbes, Alameda; A. R. Franklin, Sausalito; F. W. Geiger and G. V. Matthews of San Francisco. The principal place of business of both companies is given as San Francisco. Rumors has it that the two companies have been organized by interests allied with the Sierra and San Francisco Power Company, the former to take over plants in Santa Cruz and San Benito Counties controlled by John Martin and associates the latter to operate properites owned by W. P. Hammon and others embracing the Monterey County Gas & Electric Company, the Pacific Grove Railway Company and the Salinas Valley Water Company.

ILLUMINATION.

SANTA ROSA, CAL.—There was but one bid for the franchise applied for by the Great Western Power Company, and that company was granted the franchise.

ANTIOCH, CAL.—Van E. Britton has been granted a franchise to lay, operate and maintain a system for the distribution of gas, gas pipes, conduits, etc., for furnishing the town with light, heat and power.

FLORENCE, ORE.—A franchise will be granted to G. G. Bushman of Sheridan, to install an electric lighting plant and operate the same. Contractors will start the construction soon and have the plant in operation by September.

ALAMEDA, CAL.—The bond election involving $200,000 will be held April 30. The money is to be used in buying a new site and erecting buildings and increasing the capacity of the municipal light plant at a cost of $150,000, and in improving the police and fire department service.

SEATTLE, WASH.—An ordinance reducing the cost to the consumers from 7 to 6 cents per kilowatt hour, up to 60 kw., and 4 cents an hour for all over 60 kw., has been recommended for passage by the city utilities committee. The amendment also reduces the minimum charges for residences from $1 to 50 cents after the first year. If passed by the council the ordinance becomes effective July 1.

SALT LAKE CITY, UTAH.—The controlling interest to the Utah Gas & Coke Company has passed into the hands of Kelsey, Brewer & Company, of Grand Rapids, Mich. The price paid by the Michigan company is not announced, but it is reasonable to assume that it will run close to $750,000. The interest acquired by Kelsey, Brewer & Company is the stock owned, up to Monday, by the Farwell Trust Company of Chicago, and its associates. Kelsey, Brewer & Company specialize in the operation of gas and electric properties, and now control plants in Indiana, Michigan and Illinois, and recently acquired the Boise, Idaho, gas company.

SAN FRANCISCO, CAL.—The Universal Electric & Gas Company, of which Claus A. and Rudolph Spreckels are the leading factors, has closed a deal for a 100-vara lot fronting 275 feet on Brannan street by 275 on First. It is announced that on this newly acquired property the Universal Electric & Gas Company will erect a plant large enough to furnish illumination to this and other cities about the bay. The concern was incorporated on the 27th of last month, the capital stock being fixed at $5,000,000. J. H. Sanford and Frank Harrold of this city and P. S. Scales of San Mateo are identified with the Spreckels as stockholders in the Universal.

SAN FRANCISCO, CAL.—John A. Britton, vice-president and general manager of the Pacific Gas & Electric Company, has sent to the Board of Supervisors a statement of the items included in the total of $16,324,785.65, which was given as the amount of the company's assets in a former statement. The figures as to assets now furnished are as follows: Electric plant, $14,206,779.99; steam sales plant, $170,849.46; deposited in Bank of California on special rate case accounts, $123,512.68; material and supplies, $244,427.54; advance taxes, $22,091.23; investments other than bonds, $5647.54; bond investments, $133,118.65; bills and accounts receivable, $1,417,418.08; suspense salaries, $940.48; total $16,324,785.65. A statement of the business of the Metropolitan Light & Power Company last year, signed by Leopold Michels as president, was also submitted by Mr. Britton. It shows that the Metropolitan's revenue from gas during the year amounted to $364,092.83 and the costs to $238,282.97, leaving a gross profit of $125,809.86. The revenue from other sources amounted to $43,014.34, including $39,664.15 on account of the excess gas rates which were held by court order and $1456.49 for meter rentals. Deducting $76,881.72 for bond interest, the net profit for the year was $91,942.48. The book value of the plant is placed at $6,853,807.79; capital stock, $5,000,000; bonds outstanding, $1,625,000; floating debt, $21,777.80.

TRANSPORTATION.

WENATCHEE, WASH.—The City Council has granted an electric railway franchise to Wenatchee Valley Railway & Power Company, of which E. J. Felt is the head. It is said eastern people are backing him to the extent of $1,000,000.

OAKLAND, CAL.—Application was made of the Board of Supervisors for a 50-year franchise for a street car road on Eunice street, north of the Berkeley line, by the Oakland Traction Company. The application was referred to the roads committee for 30 days.

SUTTER CITY, CAL.—Construction work has begun this week by the Northern Electric Company at both ends of its Marysville-Colusa branch. George Summy, a Sutter rancher, put 100 head of stock at work at Terra Buena near Yuba City. Others were put to work at Meridian. The road will go one-half mile south of Sutter, as the $24,000 bonus asked by the company to change the route could not be raised.

LEWISTON, IDAHO.—Contracts for the construction of the electric line out of Nez Perce will be let within 30 days by the Pacific Light & Power Company, according to reliable information received in Lewiston. That the A. A. Welch interests are now securing bonds for their properties in Oregon to finance the North Idaho deal is definitely known. The contracts when all let, will involve close to $10,000,000.

SAN RAFAEL, CAL.—The stockholders of the San Francisco Northern Electric Railroad have decided to take no action for the present on their proposed road via Santa Rosa, Petaluma, San Rafael and San Quentin, outside of making a few preliminary surveys. The company was started by eight well-known business men who subscribed $5000 each. Of this amount they paid $25,000 for the San Quentin terminal. Later the San Francisco Northern was incorporated and the transfer made.

SALT LAKE CITY, UTAH.—Application for a franchise for operation of cars of an electric interurban railroad on certain streets of the city has been filed by Judge William H. King, representing a number of local and Eastern capitalists. This road is projected from Salt Lake City south through Salt Lake County, Utah County, and eventually into the coal regions of Emery County. Application for a similar franchise was made some time ago by a company headed by former Senator A. J. Evans and is slated to come up for consideration at an early date. One of the principal purposes of the road will be to carry the coal from Carbon and Emery Counties, where it is produced so abundantly, to Utah and Salt Lake Counties, where it can be distributed for consumption, as well as for shipment beyond the State. Preliminary surveys have been made and the company represented by Judge King says it has the necessary capital to push the road to an early completion. Formal application for the franchise will be filed within the next ten days.

PORTLAND, ORE.—The sale of the Mount Hood Railway properties to the Portland Railway, Light & Power Company, negotiations for which have been in progress for more than a year, was completed March 23. The purchasing company will assume the contract of the Mount Hood people to complete the reservoir site at the head of the Sandy River, and the rail lines of the two companies will be connected and operated as one system. The Mount Hood property consists of a small distribution system in North Portland and in the Peninsula district and a railway 20.3 miles long running up the Sandy River to a reservoir site. The railroad is not yet electrified, but is operated by the aid of steam. There also is a power house capable, it is said, of producing 15,000 kilowatts, upon the banks of the Bull Run, where the water can be obtained from a reservoir partially constructed. There is a tunnel 4000 feet long and a flume two or more miles long. It is this property which the Portland Railway, Light & Power Company has taken over.

TELEPHONE AND TELEGRAPH.

OTHELLO, WASH.—The business men here have organized a telephone company. A. B. Crawford heads the board of trustees.

WINCHESTER, IDAHO.—Both the Nez Perce Co-operative Telephone Company and the Pacific Telephone & Telegraph Company have secured franchises to operate in this city.

EUREKA, CAL.—With the coming summer the Northwestern Pacific Railway Company will commence the building of a copper wire telephone system for train dispatching on the northern division of the line to extend from Eureka to Shively.

MEDFORD, ORE.—The Federal Telegraph Company has purchased an 11 acre tract of land one-half mile east of the water tank in Central Point and will establish a large wireless telegraph station there. It is the intention of the company to erect two 300-foot towers and put in all necessary appliances to make this one of the largest and most complete stations on the Pacific Coast.

ONTARIO, CAL.—The two telephone companies have transferred their holdings to the Ontario-Upland Telephone & Telegraph Company, which has been organized here. The directors elected are H. M. Robinson, W. A. Freemire, R. B. Campbell, J. R. Pollock and R. Grant White. Campbell was chosen president; Freemire, vice-president; Robinson, secretary and treasurer and White, manager. The object of the company is to consolidate the two present systems and raise the service to the highest possible efficiency. The present rates are not to be raised, and connections between the two systems will be made in the immediate future. The two offices will be combined as soon as the switchboard can be properly arranged. Both systems will be used for long-distance calls.

APR